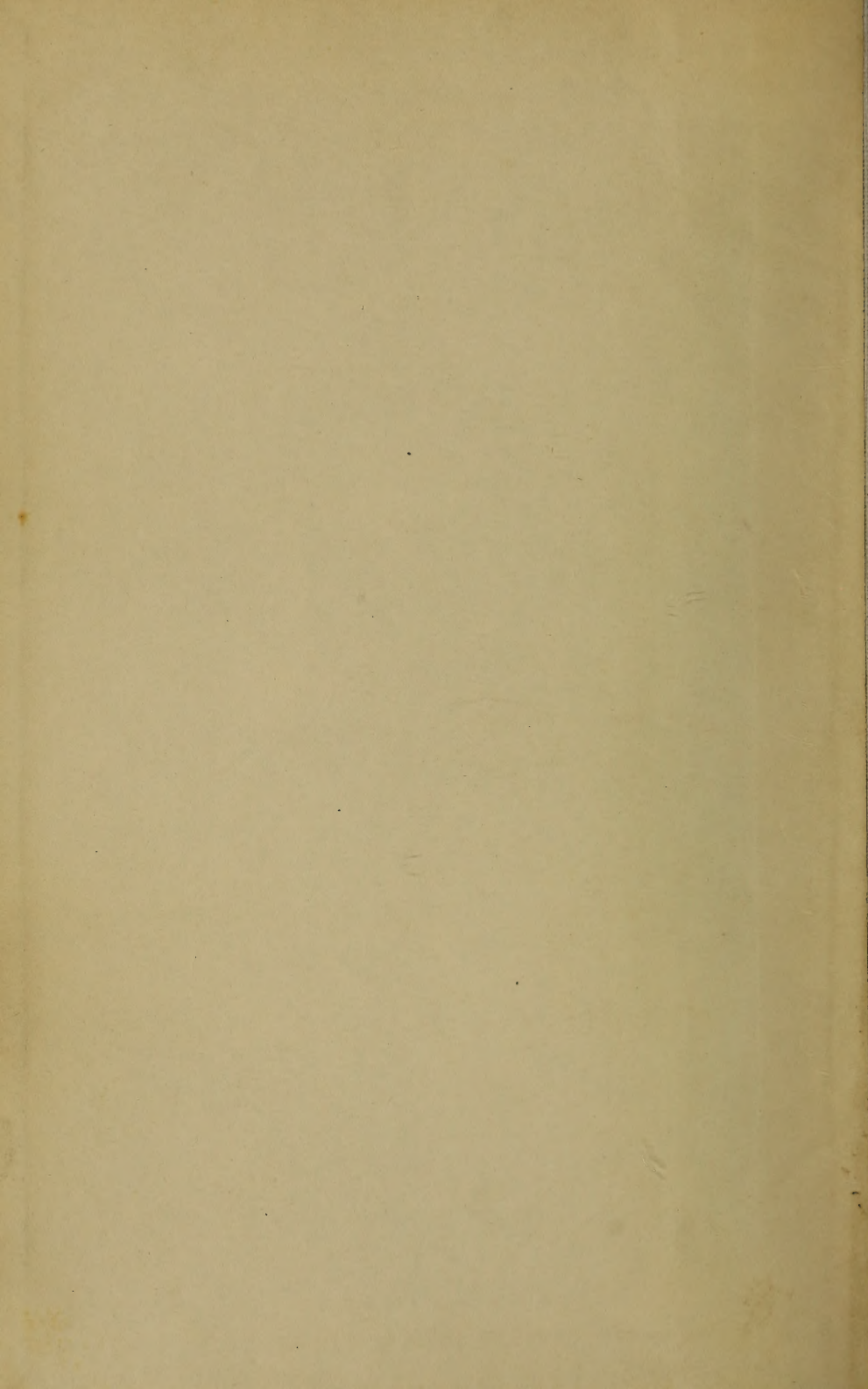
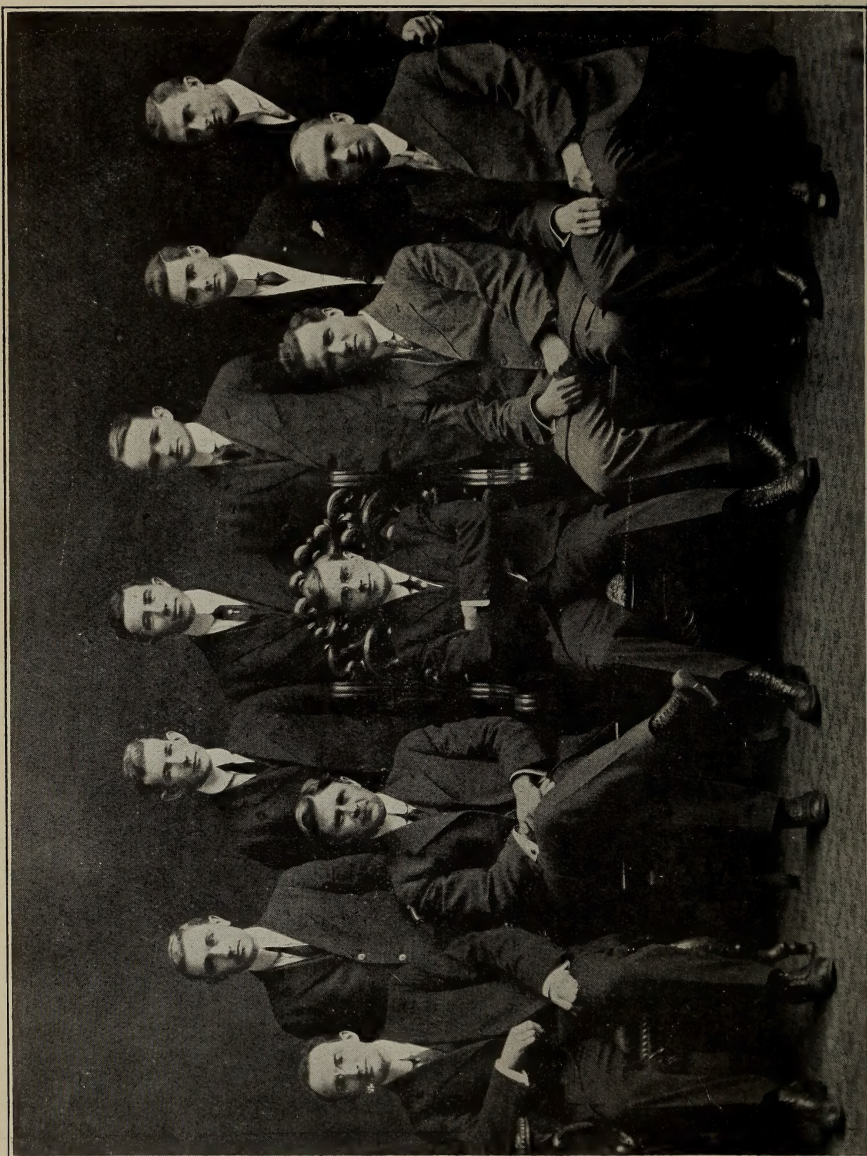


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APPLIED SCIENCE BOARD, 1911-12

Top row—R. J. Fuller, W. B. McPherson, R. J. Mickler, K. S. MacLachlan, J. E. Ritchie, C. F. Elliott.
 Bottom row—S. Dushman, Ph.D., H. E. T. Haultain, C.E., H. Irwin, B.A.Sc., F. W. Price, B.A.Sc., C. R. Young, B.A.Sc.

Applied Science

INCORPORATED WITH

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Old Series Vol. 24

APRIL, 1912

New Series Vol. V, No. 6

RETIRING ADDRESS OF THE PRESIDENT

Gentlemen:—It is the custom that the president deliver an address at the close of his term of office. This is my lot to-day, and in reviewing, to some extent, the work done during the past year, I wish to point out the great deal of attention that has been directed throughout the past months to "Getting in Touch with Graduates" and "Spreading the Name of the School Abroad."

When we mapped out the term's work it was decided to bring to our meetings speakers who could tell our members something on new phases of engineering.

The November meeting was addressed by Mr. E. H. Darling, of Hamilton, who gave an excellent paper on "Preliminary Problems in the Design of Manufacturing Buildings." At the next meeting Professor A. G. Christie, of Wisconsin, spoke, his subject being "Steam Condensing Equipment." Mr. W. H. Boyd, of Ottawa, presented a most instructive paper in February, on topographical work in connection with the Dominion Geological Survey Department. At the meeting on "Scientific Management" as addressed by Mr. Frank B. Gilbreth, of New York, we were rewarded by a record breaking attendance, well exceeding a thousand. Of those present at least two hundred were not graduates of, or students in, the Faculty of Applied Science. The last general meeting did not receive the usual large attendance, owing to press of work at the close of the term. Mr. Rudolph Hering's paper on "Sewage Purification" was a splendid treatment of this department of the great subject of sanitation.

The sectional meetings have been none the less important. The civil and architectural sections have received papers by Mr. C. R. Young, on the two great English engineers, Brindley and Smeaton; Mr. P. H. Campbell, on "Tubes of Brooklyn and Manhattan"; Mr. E. R. Gray, on "Trunk Sewer Design and Construction"; and Mr. H. J. Glaubitz, London, who spoke on the installation of a new system of water supply for that city. Mr. Frank Barber also addressed this section on "Concrete Bridges."

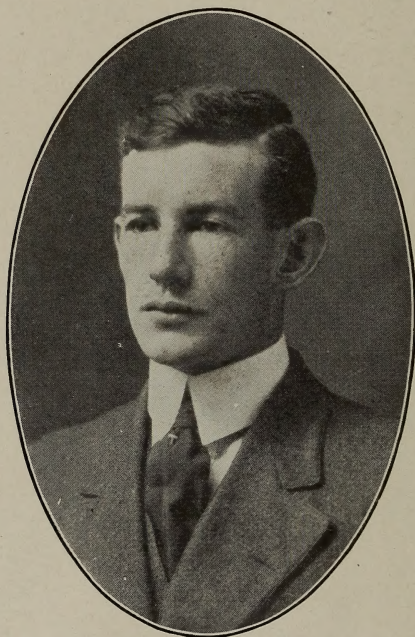
The electricals and mechanicals heard Mr. H. P. Dwight, of Hamilton, who spoke on the effect of "Double Voltages"; Prof. H. W. Price, on "Lightning, Lightning-Arresters and Line Surges"; and Mr. F. H. Moody, on "Mallet Locomotives for the C.P.R."

The miners and chemists were addressed by Mr. A. Neighorn;

and Mr. T. D. Robertson, who gave a paper on "Recent Developments in Electrical Iron Smelting."

Extremely good attendance has marked sectional as well as general meetings. The new orchestra, ably conducted by Mr. Temple, has done much to make the meetings more enjoyable, and the men connected with our new organization are to be heartily thanked for the time and work they have given during the year.

Turning to the Supply Department, which your vice-president, Mr. Fuller, has reported on; a strenuous effort has been made to have all supplies likely to be needed on hand, in large enough quantities to prevent annoying delays. Prices are kept as low as possible, and on the whole there is a saving of nearly thirty per cent. to the



The Retiring President: Wm. Batten McPherson

students on their purchases over ordinary retail prices. An accurate check is kept on all funds and stock, and the department is run on strictly business lines. The published notes and textbooks by the members of our staff are being added to constantly, and a book on Mechanics of Machinery by Prof. Angus is added this week.

APPLIED SCIENCE, under its able editor, Mr. Irwin, is doing splendid work, and is binding the graduates more closely to their School. Throughout the year letters of a very complimentary nature have been received from all over the continent. Your executive has decided to publish from now on twelve issues of the

magazine per year, instead of six as formerly. It is felt that a much wider and more useful scope can be met. The outlay required to do this will not amount to much. The subscription price to graduates and undergraduates will remain unchanged, and it is hoped that each will receive the summer issues as regularly as those of the college term.

The twenty-third annual dinner on January 18th was a success as a dinner, but not as an undergraduate function. We placed in the hands of each student an invitation and a letter explaining what the dinner really was. Much work was done in an endeavor to interest the boys, but unsuccessfully. The graduates turned out well. Many of them had not been back to the School for years. This dinner fills a very important place in our year, and the expense is not heavy enough to bother the students at large. The Commission of Conservation were our guests, and while only a small number of the members were present, we had personal letters from every province of the Dominion from prominent men who are members of the Commission, expressing interest in the work of the University of Toronto, and in our faculty particularly.

The School dance on February 9th was attended so well that the capacity of the "Old Gym" was severely taxed. The complete sixty foot model of the new Quebec Bridge, which formed a central part of the decorations, caused much surprise and commendation. This function stands out very prominently in the social life of the University.

This year has seen an important change in the curriculum. I refer to Christmas examinations. The step had been talked of for some years and your thanks are due to our predecessors for the change. The pay boxes were withdrawn from the telephones, thereby removing a popular old election plank. Smoking rooms, so often dreamed of, are entirely out of question because of the very cramped condition of the buildings. A filing system has been installed to place business on as complete a basis as possible, and records of this year's work on the file will serve as a help and guide to the new executive. A large number of factories and industrial institutions were communicated with during the year, and they all signified a willingness to give our members every opportunity of visiting them. Many of these opportunities were taken advantage of, and several large parties also made trips during the autumn term to places of interest both in and out of Toronto. The excursion to the Ontario Power Company's plant at Niagara Falls was especially enjoyable, and the same applies to the excursion to Lackawanna, N.Y.

Your thanks are due to the faculty for the deep interest taken by them in this Society, and particularly to the Dean, Professor Wright and Mr. Cockburn, for the aid and advice they have given your executive.

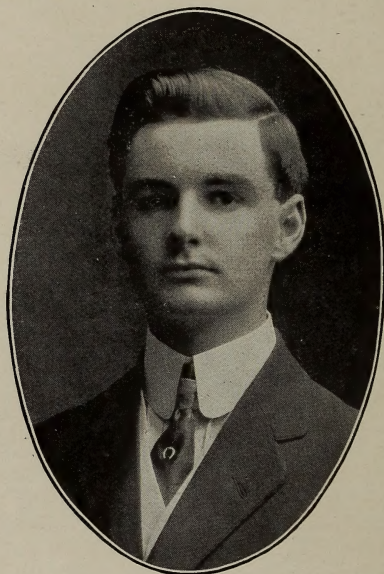
The library in the supply department has received the addition of a number of the best English periodicals, in addition to the other Canadian and American publications. New binders will be placed

on all these journals before the end of the term. Space is limited, and the equipment is about as complete as possible at present.

The finances are in a very healthy condition, as shown by the treasurer's report.

The elections on March 15th were as lively as ever, voting taking place in both the afternoon and evening. Eighty per cent of the student body voted, which was most satisfactory. The election paper "TOIKE OIKE," was published three times, with Mr. P. G. Cherry as a hard working editor-in-chief. His work deserves much praise.

It appears to me, after the experience of this term, that the students in the Faculty of Applied Science ought to take more



The President-Elect; J. E. Ritchie

interest in both the affairs of this University and our Faculty. A college course is only partially obtained in classes and lecture rooms, and there are few men here indeed who cannot afford to pay more attention to "getting acquainted with" their fellow students and shaking themselves to help their Alma Mater along. Our best graduates, the men who are doing most to **boost** the name of this institution are those who were active in their school days, both in and out of the lecture rooms. Our attendance is almost eight hundred, and every effort must be made to weld the men of "the school" into the solid family they have always been in the past. When you are away during this vacation keep the Engineering Society posted on the

graduates you meet, and what you yourselves are doing. The best advertising an institution can have comes from the men who have been within its walls. Advertise your faculty and your University.

In conclusion let me thank the members of this Society, which is the School, for placing me in this office. You gave me a strong executive, one that worked hard and one with which work was enjoyable. It is impossible to speak too highly of them. During the year we have had the broadening of the Engineering Society constantly before us, and the new executive, with the experience its President has had on the executive during this year, will ensure much success during 1912-13.

I introduce your new president, Mr. J. E. Ritchie.

WM. BATTEN MCPHERSON.

The Regina Engineering Society has just completed organization, adopted a constitution, and elected an executive council. Mr. A. J. McPherson, '93, who was City Commissioner of Regina, and resigned on the 1st inst. to assume the chairmanship of the Highways Commission of the province, is president of the organization. Mr. H. S. Carpenter, a graduate of '97, now Deputy Minister of Public Works for the Province of Saskatchewan, is 1st vice-president. Mr. L. A. Thornton, City Engineer of Regina, and 2nd vice-president of the Engineering Society, is a graduate of Queen's University. The Society is holding an inaugural dinner on the evening of May 2nd.

WHAT OUR GRADUATES ARE DOING.

W. H. Martin, '10, recently on survey work in Edmonton, is with the Hamilton Bridge Works.

N. C. Sherman, '11, is Inspector of Ordnance Machinery at Esquimaux, B.C.

H. P. Elliott, '96, has offices in the Manning Chambers, Toronto, as industrial engineer.

A. W. McConnell, '06, Department of Architecture, University of Toronto, and Mr. Stanley Makepeace, have formed a partnership to engage in architectural work, with offices in the Kent Building, Toronto.

W. F. Grant, '98, has resigned as city engineer for Sault Ste. Marie, Ont., and Mr. W. W. VanEvery, '99, assumes the position. The city has in view the construction of considerable new sidewalks and pavements, and sewerage works.

G. C. Parker, '10, is associate editor of "Motor" magazine, Saturday Night Building, Toronto.

W. A. Clement, '89, formerly city engineer of Vancouver, has been appointed chief engineer of South Vancouver.

F. T. Nichol, '10, is assistant engineer to Clarence W. Noble, Toronto.

SEWAGE PURIFICATION*

By RUDOLPH HERING, D. Sc.

The subject of sewage purification, on which you have asked me to talk to you to-day, found its first scientific and practical development in England during the latter half of the last century. The quantity of sewage to be dealt with in that rapidly growing country, increased so greatly that, more than elsewhere, it presented very serious conditions, both dangerous to health and productive of nuisances. Further, the rivers of England, into which the sewage of interior towns was first naturally discharged, are small, not only because of the small watersheds, but also because the rainfall upon most of the area is only about one-half of what it is near our Atlantic Coast. Objectionable results were, therefore, sooner felt than would otherwise have been the case.

The first material advance that gave satisfaction was the discovery between 1860 and 1870 that sewage, spread upon porous sandy material and allowed to percolate through the same intermittently at a rate equivalent to the sewage of 1,000 persons per acre, allowed a purification to take place so thoroughly that the effluent water was not only clear and non-odorous, but was deemed entirely healthful for fish life, and for cattle.

In the next decade, this method of purification was adopted for treating the sewage of Berlin and then of Paris, and is still employed successfully by both cities upon the large areas of sandy soil in their vicinity. About 1890 a very extensive series of experiments on a large scale made at Lawrence, Mass., confirmed the scientific basis for this method of sewage purification, which was the action of bacteria and other low forms of life, first suggested by Dr. Alex. Müller, City Chemist of Berlin, about 1880. Since then it has been applied in all civilized countries where suitable conditions were available.

It was not possible, however, to find, particularly in England, sufficient area of porous land for all or even for most of the cities. Some other means had to be devised, and a so-called chemical precipitation method came into use. By the addition of certain chemicals, such as lime, sulphate of alumina, etc., the sewage was clarified, and it was thought sufficiently purified to be turned into streams. This purification, although a material step of progress, was not real. The resulting precipitated suspended matter, forming what was called a sludge, was so objectionable on account of its offensiveness, and the clarified liquid which still contained putrescible matter again became so foul, that the method was only adopted where none other was available, and research was further continued.

Near the end of the last century, it was found, chiefly in two cities of the northwestern part of England, in Salford and Accrington, that in the absence of sandy soil, it was practicable to make sewage liquid non-putrescent on a large scale, by allowing it to percolate slowly through beds of stone, from one-half to three inches in

*Read before the University of Toronto Engineering Society, March 27th, 1912.

diameter. This advance caused the adoption of so-called percolating or sprinkling filters, which, on account of their economy, are being extensively introduced.

About the same time it was also found in England that, by leaving the sewage liquids repeatedly in contact with the stone surfaces in similar beds of stone, after they had become covered with bacterial slime, a like purification resulted, not only in the liquid but also of some of the solid matter. These so-called contact beds have also since been extensively adopted.

For nearly thirty years, and until quite recently, efforts have been made to find some means of overcoming also the other trouble, namely, the sludge nuisance resulting from the above methods of treating the liquids. The so-called septic tank was suggested in England about twenty years ago to solve the difficulty, as it had been found that the sludge under certain conditions would largely rot away, and therefore, leave a much smaller amount for final handling. But the anticipations as to the extent of the rotting away were not realized and the whole process was very offensive, leaving the question still surrounded with doubt as to a satisfactory treatment.

During the last decade, Dr. W. O. Travis, of Hampton, England, made a further advance by separating the suspended matter from the liquid more thoroughly than had heretofore been attempted, believing that the main trouble lay in the fine, suspended and colloidal matter. He used an upper and lower chamber for the sewage tanks. The sewage was to flow through the upper one and be retarded sufficiently so that the heavier suspended matter would drop through a horizontal slot and slide into the lower chamber for deposit and subsequent removal. It was deemed necessary by Dr. Travis, that while about four-fifths of the sewage should flow through the upper tank, about one-fifth should flow through the lower tank. While this separation had advantages, it was found that the sludge, when it was taken from the lower tank, still gave off an offensive odor.

Experiments were made with the Travis tanks in Essen, Germany, by Dr. K. Imhoff, beginning about 5 years ago, which proved that, by completely preventing a flow through the lower tank, a decomposition of the sludge could be made to take place in an inoffensive manner, and that the sludge, when withdrawn, after a few months had no longer an offensive odor. These same results have since been verified, not only in Germany, but also in the United States and England, so that this new and unexpected result, produced by the so-called Imhoff Tanks, has caused the subject of sewage purification to be viewed in a new and more encouraging light.

We can now say that, under conditions found in large as well as small cities, on sandy as well as clay soil, along small as well as great rivers, it is practicable to dispose of the sewage from inhabited territory without causing offensive conditions, either from its liquid or its solid matter.

It is my intention to briefly outline what to-day we consider to be the chief principles upon which this inoffensive sewage purification is based, and which enables us to design and operate works in a manner more satisfactory than was possible but a few years ago.

Sewage, Its Definition and Characteristics

At the outset it will be well to understand as clearly as practicable the conditions of the material with which we have to deal. Let us, therefore, realize that sewage is practically the dirty water resulting from the washing of our bodies and clothes, implements and articles of use, the floors of our habitations, and chiefly from the discharges from our bodies. Sometimes the rain water running off from the surface of the land, of city streets, roofs, etc., also forms a part of the sewage.

An analysis of this dirty water shows, on this side of the Atlantic, about one part of decomposable organic matter to 5,000 and even 10,000 parts of water. This, apparently great dilution does not, however, prevent a putrefaction of the sewage from taking place under favorable conditions with resulting foul odors.

The water which is used to receive and carry this dirt along in suspension, from the point of origin to the point of final disposal, is the usual water supply of a city. In some cities it is augmented by the rain water washings from the surface which combine with the sewage in what we call a combined system of sewerage. Where the rain water is prevented from mixing with the domestic sewage, and where it is taken away in separate drains, we speak of the separate system, which has substantially two independent net works of piping to dispose of these two waters in different ways and to different points of outfall.

The characteristics of sewage proper are quite complex. Let us first consider those which prevail within the first few hours of its existence.

In a separate system we have in the domestic sewers the sewage proper, and in the rain water drains the surface washings from the general city territory. Analysis and other studies indicate that in a city where the streets are not well cleaned, the first water entering the drains from a rain storm has a composition, which, so far as subsequent objectionable results are concerned, is not materially different from that of the sewage proper. For this reason the so-called combined systems, receiving both sewage and street water, particularly in large cities, have been favored and preferred for economical reasons, as they require but a single network of sewers and more simple management. The question as to the preference between separate and combined systems for any given city or for part of a city, must be carefully investigated and decided chiefly on economical grounds.

Domestic sewage is a carrier of disease germs and a carrier of the nonresistant organic matter which, within a few hours, may putrefy and cause a nuisance. The disease germs enter chiefly from the excretal discharges, and wash water of the body, and the

laundry waters; in some cases also from the water used in cleaning implements and rooms. The putrescible matter enters also from kitchen waste water, food rests, dish washing and house cleaning, containing a large amount of matter which readily becomes putrescent.

Sewage may be divided into solids, colloidal suspensions and solutions. The solid and colloidal matters entering the sewage are carried along, and if the velocity of the sewage is sufficient they may be kept in suspension until the sewage is finally discharged.

Sewage does not remain long in the condition in which it enters the sewers. Changes take place in different ways. The matters in solution are at first limited to very few sources, the chief of which are urine, mineral salts, and a few nitrogenous compounds. As sewage flows along the dissolved matter, however, increases rapidly so that analysis in fairly good sized cities show that about half the organic matters of sewage are in solution, while the other half are in suspension. The matter in suspension includes also what is usually called colloidal matter, and that which is in the state of emulsion, consisting chiefly of nitrogenous substances of more or less complex character as soap, fat, some cellulose, etc.

When the velocity of the sewage changes, the heavier suspended matter deposits and some is attracted by the sides of the sewer, both remaining until the velocity is again increased to wash this retained matter away. While it is in a state of retention a change is apt to take place through bacterial action, as will presently be mentioned.

While the sewage is flowing along, the dissolved matter, as already stated, is increased in quantity, and that part of the suspended matter which is most easily reduced, is converted by bacterial action, into liquids and gases.

Another class of changes may take place, if sufficient time elapses by long retention, as a coagulation of some of the colloidal and dissolved matters on the one hand, and on the other a de-solution of dissolved matter by its conversion into colloidal matter. The latter phenomena are chiefly the result of the life of bacteria and of the forming of the bodies of other small organic life, inhabiting the sewage or the slimy matter attached to the material adjoining which sewage flows.

An important factor further is the temperature at which the decomposition of putrescible matter takes place. There is an optimum temperature at which the decomposition is most rapid, because it is the best for the life of the bacteria and insects which cause it. Unfortunately, it is rarely possible to control the temperature of sewage to any extent, and, therefore, to make use of the best temperature.

Finally, it should be stated that the main causes of change in sewage originate mostly in the excretal discharges and such waste matter which has allowed of bacterial development before entrance into the sewers. The decomposition which takes place at first causes a seizure upon the oxygen dissolved in the water and upon

that which is available from the decomposition of some of the matter contained in the sewage. So long as such oxidation can take place the sewage is not offensive. As soon as the oxygen is exhausted other processes begin; a so-called anaerobic decomposition takes place, creating hydrogen and carbon compounds, and when the sewage is exposed to certain classes of bacteria, putrefaction and offensive gases result, constituting the cause of the foul smells which we observe from sewage.

Fundamental Requirements for Sewage Disposal

The chief requirements which the engineer has to satisfy in devising works for sewage disposal, can be divided into two classes, the first relating to the destruction of disease germs, and the second to the prevention of nuisances.

The destruction of disease germs may be accomplished in two ways, namely, by starvation or by disinfection. Starvation means the creation of conditions by which the environment causes the disease germs to perish from lack of suitable nutriment or conditions of life. Disinfection is produced by the addition of some matter poisonous to the bacteria which causes them to be disintegrated or the conditions for their life eliminated.

The other fundamental requirement for sewage disposal is the prevention of nuisances. As nuisances are caused by the putrefaction of sewage, we first conclude that if sewage is sufficiently diluted and exposed to a sufficient amount of oxygen, then there will be a process of oxidation instead of putrefaction, and no offensive conditions result. The necessary amount of oxygen can be obtained from the air and from water, when the conditions in each case are favorable.

In the absence of the necessary amount of oxygen the decomposition of sewage matter may be offensive or it may not be so, depending upon the organisms which effect the decomposition. Much is yet to be learned regarding these organisms, but at the present time practical experience has developed sufficiently, so that in most cases it is practicable to foretell whether the decomposition will be offensive or not.

To prevent a nuisance in the decomposition of sewage matter we must satisfy three conditions: First, we must separate the liquids from the solids, then we must oxidize the liquids, and thirdly, we must effect a satisfactory decomposition of the sludge. By separating liquids and solids we are enabled to treat each part by itself, according to the ways and means best adapted to each case, because the best method of treating liquids is generally different from the best method of treating solids.

In dividing the sewage into liquids and solids we must realize that, strictly speaking, the division is not correct. What we call liquid in this case includes a large amount of fine and suspended colloidal matter which will not readily separate from the true liquid and deposit. As will be seen presently, this fine colloidal matter is best treated together with the liquids and not with the solids.

The oxidation of the liquids, as thus defined, will take place by having a sufficient amount of air brought in contact with them. It would lead too far to go into the details of the oxidation process, and it must suffice to state here that unless a sufficient amount of air is brought in contact with the liquid, putrefaction may take place.

The decomposition of the suspended matter after it has settled out as sludge, cannot be accomplished by oxidation, because there is no way of bringing a sufficient amount of oxygen into contact with every part of the sludge. It is possible in a dry climate to effect a decomposition of dead putrescible organic matter through *eremacausis* by an exposure to sunlight and air, without offensive results. But it cannot be done in our climate, and means other than oxidation must be used.

PRACTICAL METHODS OF SEWAGE DISPOSAL

After having defined sewage and stated the chief requirements for sewage disposal, it now remains to discuss the practical methods by which such a disposal may be secured.

Let us first consider the case when the sewage must be treated entirely on land.

Treatment of Sewage on Land

As stated at the outset, the object of treatment is to destroy the disease germs which may be in the sewage, and to prevent a nuisance during the process of changing the raw sewage into water and non-offensive sludge.

In order to accomplish this result most effectively and most economically, it is necessary to deliver the sewage to the place of treatment as fresh as possible, and still retaining oxygen in solution, which with good sewer construction and good flushing is nearly always practicable.

The second condition is to substantially separate the liquid and the solid matters. This is partly accomplished, first, by the introduction of screens which will keep out the grosser floating matters and allow them to be separately dealt with. These screenings do not necessarily cause trouble as they constitute a comparatively small part of the sewage and can readily be buried or burned.

The next process is the separation of the heavier suspended matter by deposition. To accomplish this it is necessary to reduce the velocity of the sewage to a very slight one, so that the sewage may be retained from one to three hours, according to circumstances, during which a sufficient deposition may be effected.

The result will be that the clarified sewage can run off without having been retained sufficiently long to have exhausted the oxygen dissolved in the sewage, and, therefore, not sufficiently long to have become septic and foul smelling.

The subsiding suspended matter should slide through a horizontal slot into a lower chamber for final decomposition, and in such a manner that it will not rise again to mix with the fresh sewage. Such conditions are provided by the Imhoff tanks, the only process

known at the present time, which simply and rapidly produces an inoffensive sludge, preserves the fresh condition of the sewage, and at the same time reduces the sludge quantity by decomposition to about ten per cent. of the amount originally depositing in the lower chamber.

The only explanation of the inoffensive decomposition in the Imhoff tanks so far suggested is, that the prevention of any flow through the lower chamber precludes a continuously added large supply of the many species of bacteria which accompany sewage. The result is a gradual extermination and elimination of most of the various classes of bacteria, fortunately leaving only those which produce methane, hydrogen, nitrogen and carbon dioxide gases, none of which are offensive. The bulk of the escaping gases are 75% methane and 25% carbon dioxide. If we remove some of the sludge from the lower chamber before it is sufficiently decomposed or the putrescible matter entirely rotted away, and expose it to the air for some time, then offensive gases will soon be evolved, showing that in the lower chamber, where the sludge is confined, a different bacterial condition prevails from that where the sludge is exposed either to fresh sewage or to the atmosphere.

To cause the decomposition to be as rapid as possible, it is necessary to have as much movement of the sludge particles as possible, which dissipates the resulting products of decomposition and exposes new surfaces to bacterial attack. The movement is accomplished chiefly by the gas bubbles rising through the deep mass of sludge, and also whenever advisable, by introducing clean water through perforated pipes at the bottom. The introduction of this water also loosens the sludge near the bottom and facilitates its final withdrawal.

According to the nature of the sewage and climate it has been found that sludge will not rot sufficiently to be inoffensive in from two to five months. When it is withdrawn it has a slight odor of tar, which, however, can be perceived only a few inches distant. It is filled with bubbles of compressed gases due to the fact that the sludge has been compacted under a water pressure usually ranging from 20 to 30 feet. On the release of this pressure the sludge therefore begins to expand, like rising dough, and therefore becomes quite porous. This porosity allows the water, which is still contained therein, to drain out, with the result that the sludge, if spread upon under-drained beds, can be dried within a week's time so as to be spadable and removed. No offence is connected with the sludge discharge and removal and the water draining from it is quite inoffensive and generally clear.

The sewage after passing through the upper chamber of the tank, if it must be further purified on land, is treated by a process of oxidation, and if necessary, subsequently by a process of disinfection. It is practicable to oxidize the liquids, as already stated, by intermittent filtration through beds of sand, by so-called percolating or sprinkling filters, and by so-called contact beds.

In the first case, when the liquids flow upon sand beds, we may abandon the preliminary deposition of sludge and permit it to

be deposited upon the surface of the sand bed, where it may be so thoroughly exposed to the air that putrefaction can be prevented, and an inoffensive decomposition by oxidation substituted. The oxidation of the liquid, percolating through the sand over a very large surface of bacterial slime which covers the grains of sand is very thorough and sometimes produces an effluent equal to that of spring water.

In the second case, the oxidation is produced by a percolation of the liquid, spread out in drops like rain over the surface of a bed of broken stone at least 6 ft. in depth. The spreading out is done either from fixed jets or from traveling distributors, either rotary or parallel, which distribute the sewage drops over the surface of the bed. While percolating over the surfaces of the stones, which vary in size according to different plants from half inch to three or four inches in diameter, the air circulating through the interstices makes the rapid oxidation possible. When the liquid issues at the bottom of such works, when they have been properly designed and after sufficient time has been given for the percolation, it is non-putrescent. The purification has been accomplished partly by bacteria living within the slimy coating surrounding the stones and partly by other lower forms of life inhabiting the interstices.

When the coarse grained filters permit the growth of myriads of insects and plants, transforming the dissolved matter into the colloidal matter of their bodies, then the remains of this life in a well proportioned and operated filter constitute chiefly the so-called humus, which is washed out of the filter, when both temperature and increased flow are favorable for its detachment and removal. Where the discharge of such humus into the receiving water course is objectionable, a second settling basin is usually interposed to allow of its deposit therein. This second basin can be utilized also for a disinfection of the effluent, should it be required.

In the third case, the oxidization is produced by a sufficiently long contact of the sewage with the grains of material forming contact beds. In order to have a sufficiently large slimy bacterial surface for the oxidation and an opportunity for the dissolved organic matter to come into contact with it, these contact beds must be made of much finer grained material than percolating beds. Therefore, they eventually fill up by clogging and require cleaning or replacing. The oxidation takes place substantially upon the bacterial surface after the sewage, except that which adheres to the grains, has been withdrawn. After a sufficient oxidation has taken place the bed is again filled with sewage to wet the grains. The same sewage requires to pass two or three times through such a contact bed before it is sufficiently freed from its sewage matter to become nonputrescent. One to three doses a day have thus been treated.

If it is necessary in these three cases to disinfect the liquid issuing from the beds, some chemical, generally hypochlorite of lime, can be applied to the effluent, which has been practically relieved of its suspended matter, and can, therefore, be disinfected quite economically.

Treatment of Sewage by Dilution in Large Bodies of Water

Where large bodies of flowing water are available, and practically saturated with dissolved oxygen, it is possible to effect the oxidation of sewage liquids by mixing them with such water. The oxidation in this case is not as rapid as when the oxygen is derived from the air, because of the smaller amount of oxygen contained therein.

Experience has shown that in order to oxidize sewage by running water it is necessary, depending upon the character of the sewage and the flow in the water course, to have an available flow of from two to six cubic feet per second of water, saturated with oxygen, to purify the sewage from 1,000 persons. Where this amount of water and oxygen are not available it is not possible to effect a satisfactory purification by dilution.

It is often practicable, however, to precede the dilution by a preliminary treatment to a degree to still enable the diluting water to accomplish the remaining purification.

If we consider the destruction of disease germs, this can be effected in a case of dilution, either by allowing the germs gradually to starve from the lack of suitable conditions for their life, or by their destruction through disinfection. That sewage bacteria rapidly perish, after entering a stream of clean and well oxygenated water, is in evidence wherever such conditions exist. Disinfection can be accomplished by adding hypochlorite of lime sufficiently far up the sewer before it discharges, so as to become thoroughly mingled with the flowing sewage. In Europe this disinfection has been practised for a number of years in a number of cities before discharging their sewage into rivers.

Where we desire to prevent a nuisance, the first treatment should be a screening out of the floating matter. This will prevent the visible evidence of sewage nuisance. Then, if the river or stream has sufficient quantity of water and contains sufficient oxygen to oxidize the screened sewage, it should be discharged into this body of water in such a manner that the sewage is thoroughly dispersed and brought as rapidly as possible in contact with the oxygen available. This dispersion is best effected at the bottom of the river and across the current.

When the flowing water is neither sufficient in quantity, nor has a sufficient velocity to carry the easily putrescible organic matter in suspension until it is oxidized, it will then be necessary to pass the sewage through settling tanks before entering the river. In these tanks this suspended matter can settle into a lower chamber, as already described, and decompose sufficiently so that, when removed after several months, it will be inoffensive and can be taken to final places of disposal without objection.

We have now hurriedly passed over the field which has become available to the engineer for disposing of the sewage from cities without any offence under all usual conditions.

To recapitulate, if the sewers are kept clean and flushed so that the sewage remains fresh, no putrefaction should result within them

and the sewage can be delivered at the disposal works before it is offensive. This result is accomplished in many instances. If we then separate the liquids from the sludge in a thorough manner, the liquids will remain fresh and the sludge can gradually and inoffensively decompose and be converted into a material resembling forest soil, to be disposed of in any desirable way without objection.

If the liquid sewage, after being freed from the sludge, requires further purification, it is practicable to oxidize it without offence either on sand filters, in percolating beds or in contact beds, which ever may best suit the local conditions.

All of these stages of sewage treatment can now be accomplished without serious difficulties, with an assurance of success and at a reasonable cost.

THE ARMY OF GOD KNOWS WHERE

No bands are playing gaily when they're going into action,
No crowds are cheering madly at their deeds of derring-do;
They are owing small allegiance to any flag or faction—
Their colors on the skyline and their war-cry, "Put it through!"

Ahead of both the Bible and of late repeating rifle,
The flags can only follow to the starting of their trail;
They heard the leagues behind them, every mile the merest trifle;
They mark the paths of safety for the slower sail and rail.

Their standards kiss the breezes from the Arctic's cooling ices
To where the South Pole's poking out its late discovered head;
You can see their chains a-snaking through the lands of rum and
spices—

And East and West you'll always find their unrepining dead.

No time for love and laughter, with their rods upon their shoulders,
No time to think with vain regret of home or passing friends.
They are slipping down the chasms, charging up the mighty boulders,
The compass stops from overwork; the pathway never ends.

They slit the gullet of the earth; disgorge its hoarded riches
(But life's too short for them to stop and snatch a rightful share);
They've a booking on the Congo putting in some water ditches;
A dating to take tea with death; they make it by a hair!

You will find their pickets watching in the unexpected places;
You will hear them talking freely of The-Things-That-Can't-Be-
Done;

Oh, the Faith they speak so strongly and the Hope that's in their
faces—

It lights the gloom of What's-the-Use as brightly as the sun!

No bands are playing gaily and no crowds are madly cheering;
No telegraph behind them tells their deeds of derring-do;
But forward goes the legion, never doubting, never fearing—
Their colors on the sky-line and their war cry, "Put it through!"



THE INDUSTRIAL CHEMICAL CLUB

Top row—G. L. Gooderham, W. D. Morris, G. E. Clarkson
Bottom row—A. R. Bonham (Treas.), E. R. Williams (President), A. W. Sime (Sec.)

THE YOUNG ENGINEER AND THE TECHNICAL SOCIETIES

By C. R. YOUNG, A. M. CAN. Soc. C.E.

Experience has shown that it is not good for man to be alone in a professional any more than in a domestic sense. The engineer who confines himself strictly to his own interests not only limits his usefulness to his own profession and to the community at large, but at the same time defeats his own personal ambition. Minding one's business is commendable, but it may be overdone. The names of those who mind other people's business, and do it well, are written largest in the history of every country. The engineer, perhaps more than anyone else, needs to appreciate this. His forced independence and tendency to absorption in narrow and non-popular specialties lead strongly to isolation, even from engineers engaged in other fields—a condition to be avoided at all costs. Alone his strength is merely his own, but in co-operation with his fellow-engineers, he in a certain measure commands the resources of all.

Almost as soon as engineers began to have any existence at all as a body, the need of union and co-operation was felt. Like most primitive desires, this was chiefly for personal improvement and advancement. The young English-speaking engineer in the time of Brindley, Smeaton or Telford, could not obtain the fundamental training for his profession in a technical college, for such institutions did not exist. Outside of what, he himself discovered by experience as an apprentice or as an independent practitioner he gathered largely from discussion with other engineers and observation of their works. Books on engineering subjects were few and principally in foreign languages. As a consequence of this, and, "impressed by what they themselves felt with the difficulties young men had to contend with in gaining the knowledge requisite for the diversified practice of engineering," a few young men now nearly a hundred years ago, formed themselves into that venerable organization upon which all engineering societies in the English-speaking world have been directly or indirectly based—the Institution of Civil Engineers of Great Britain. Under existing conditions it was not to be expected that altruistic motives would predominate, and so in the original constitution of the new society we find that it was formed for "the acquirement of professional knowledge, and for promoting mechanical philosophy." Led by the great Telford, its first president drawn from the ranks of already-famous engineers, the Institution prospered and its usefulness grew apace. From the beginning the great personal assistance derived from papers and discussions fully justified this initial effort in the organization of English-speaking engineers.

But the field of the technical society does not end with the dissemination of useful scientific knowledge, however important that may be. There are many activities entered into by the great organizations of technically-trained men which ultimately serve the engineer much more than by extending his knowledge. One line of action of a great engineering society which commends itself

to all, and which merits increased attention, is the effort to safeguard the interests of the profession and to raise a defensive front as wide as the continent against unfair treatment of our own engineers. The importation of foreign engineers to do work for which our own men are capable and ready; the malicious attacks of vote-catching politicians and second-rate newspapers, on able and upright members of the profession; the blocking of legislation calculated to raise the standing of the engineer, and place him on a footing with other professional men—these are a few of the injustices which are now engaging the thought of the foremost men in the great engineering organizations.

Still more effective than these external activities are the efforts of the profession to improve its status from within. There are now, thanks to the engineering societies, certain well-recognized principles of professional conduct which, while not commanding that full adherence they deserve, are receiving a growing observance. Among representative members of the engineering body, it is as uncommon for an unfair advantage to be taken of a rival as it is among those who practice the healing art. Out of this springs a larger respect for the engineer, and a fuller recognition on the part of the public of his integrity and the dignity of the profession in which he is engaged.

Reassuring though these beginnings of corporate action have been, there is a vaster work, by far, ahead. We have done almost nothing, compared with what might have been done, and what must be done if the engineering profession is ever to come fully to its own. The promotion of engineering education—the first care of the technical societies in their early years—has been of immeasurable importance to both the young engineer and the established practitioner, but no organization of engineers can adequately fulfil its mission on that basis alone. Nor can purely defensive measures, coupled with technical efficiency, bring about the desired result. Nothing short of aggressive, constructive work of a public, and even of a national character can bring engineers as a body into that enviable position now occupied by such organizations as, for example, our Boards of Trade—bodies which, while formed primarily for the furtherance of their own interests, do a vast deal of invaluable work for the public. On all public questions involving great constructional projects, such as national railways, improvements of navigation or public development and transmission of power, no organizations could with greater weight or propriety express their views than the great national engineering societies. As a result of bringing to bear on public questions of commanding importance a weight of valuable technical opinion, there would arise that prestige and public regard which should rightly be associated with great professional organizations.

If this high ideal of public service is ever to be realized it must gain its impetus from the concerted action of the younger men of the profession. Most great reforms have their sources in the generous enthusiasms of youth. The actualizing of the idea may be possible only by the steady support and co-operation of men of

mature years and large experience, but the driving force must come from those whose work is in the future rather than in the past. In any such action numbers in themselves lend confidence. At Waterloo, the appearance of Bülow's division encouraged the whole wavering British line to assume the offensive. An assurance of loyal and extensive support in worthy movements, more than anything else, determines the policy of an organization. The aggressive institution needs the constant accession of new men with fresh ideas and unspent energies.

Practically, the service of the young engineer to the organized profession may come in a variety of ways. He should join the societies or associations in which his interests chiefly lie; he should regularly attend their meetings and discussions and contribute whatsoever of his own that may be of value; he should be willing to accept office or membership on committees, but only in so far as may be consistent with effective service; he should co-operate loyally with the other members of his association in putting its official views before the public; he should, as a member of his society, rush to the defensive in speech or in writing when the profession or any worthy member of it is subjected to an unjust attack; and he should, finally, so conduct himself professionally and privately that those who have withheld their sanction of engineering as a profession will be forced to accord to it that honorable position which has characterized the ancient pursuits of medicine, law and divinity.

As with all unselfish acts, the young engineer in giving his best to the society of which he is a member, derives a personal advantage not attainable by those who stand apart from their fellows. The preparation of papers and discussions is in itself a training, as the early engineers found, of the greatest value. There is nothing which can quite so well clarify one's ideas on a given subject as an attempt to explain it to others either verbally or in writing. The intensiveness of thought essential to carrying on an effective discussion coupled with the suggestiveness of an opponent's questions bring to light ideas which before were unthought of. All this is apart, of course, from the receipt of numerous valuable professional papers which are incorporated in the proceedings or transactions of the great technical societies and which constitute a perquisite of members of all grades. Such literature is of the greatest consequence, and particularly so to the young engineer. The subjects treated are covered more fully here than in text-books or even in the pages of the technical journals. Besides the original papers, many pages of discussion, often of quite as great value as the papers, are published from which commentary ideas of considerable assistance to the young engineer are gleaned. There is also the advantage which the possessor of such a series of proceedings enjoys, in that the matter therein presented is available months, or perhaps years, before it makes its appearance in text-books.

A personal advantage which the member of a technical society of national standing enjoys is the classification which it gives him. The holding of a certain grade of membership is a certificate of

experience of a minimum extent and is, in some measure, a testimonial of good character. If nothing more is gleaned from this by a prospective employer or client than a generally favorable impression of the standing of the applicant, it has served its purpose well. In all the great national engineering societies, the possession of Membership—the highest grade—is greatly coveted and counted a professional asset of no mean value.

Covering, perhaps, every branch of engineering or applied science and art, there are technical societies of high standing which are ready and willing to admit the young engineer or technically-trained worker on easy conditions. Without exception they look upon the accession of the young men to membership with favor and even concern. The influence of every such organization will largely be measured by its numbers, and every new recruit added to the list means another member who may some day stand high in the councils of the society and bring honor and dignity to it and to the profession which it aims to safeguard. For those interested in the various departments of civil engineering, in the broad sense, and including therefore mining, mechanical and electrical engineering, there is our own Canadian Society of Civil Engineers—the pioneer national engineering society of Canada. For the specialist in mining and metallurgical engineering there is the Canadian Mining Institute and the Institution of Mining and Metallurgy of Great Britain. The mechanical engineer may find it profitable to be enrolled on the membership list of the Institution of Mechanical Engineers of Great Britain or the American Society of Mechanical Engineers; and for the electrical engineer, there is the American Institute of Electrical Engineers. The young architect will find it desirable to identify himself at the earliest possible moment with the Association of Architects of his own province. The chemist and the chemical engineer has a choice of a number of organizations of which the Society of Chemical Industry is, in Canada, perhaps the most popular.

Finally, let it be impressed upon the young engineer, that if he would make the best of himself, and be of most value to the public at large, he should lose no time in associating himself with those engineering organizations of which he is by training and taste best qualified to become a member.

THE UNIVERSITY CLUB OF REGINA

On March 16, 1912, the first annual dinner of the University Club of Regina was held, "amid," according to the local press, "a series of most unearthly yells, with echoes flying into the farthest corners of the hotel." Some forty guests were in attendance, representing the following universities: Oxford, Liverpool, Aberdeen, Edinburgh, Glasgow, Mount Allison, Manitoba, Queen's, McGill, and Toronto. With their hearts atune to the old-time slogans, which many of them had not heard for years, they revealed, in the proposals and replies ensuing from the

toast list, a very thorough appreciation of the aims and motives of the organization.

Mr. J. F. Bole, M.L.A., proposed the toast to "Our Country," dwelling particularly on the need of more thorough appreciation of higher things than dollars and cents, particularly in the western part of our land, a need which, as an old-timer, he has seen grow more and more pressing. He believed that the University Club should be a strong factor in promoting the desire for a higher type of citizenship, and as such he believed it would be welcomed.

"Our Province" was proposed by A. D. Anderson, who gave some striking illustrations of the possibilities and growing importance of Saskatchewan, and in conclusion suggested that we should not forget to "boost Saskatchewan" as well as particular cities. In reply, Dr. Corbett called on the club to remember its particular duties of citizenship to Saskatchewan, the land which had presented wider opportunities than older lands to most of those present.

In proposing "Our Alma Maters," S. R. Curtin, secretary-treasurer of the club, reminded the members that what our Alma Mater expects of her children is an effort to serve the best interests of humanity instead of an entire devotion to material gain. She expects each of her children to help toward a higher social plane in which life will be more livable and men and women more lovable.

In reply to the toast the honorary president, Dr. Andrews, spoke of the ideals set up by a university. These ideals should reach higher than town lots. The best enjoyment is intellectual enjoyment, and this in turn should fit a man for the highest duties of citizenship and give him ideals which would be for the service of humanity. The doctor drew attention to the fact that when the college man graduates he is a debtor to society, for he has not paid for the advantages which have only been made possible by the philanthropy of those who make universities possible, and for the devotion of those teachers in the university who devote their lives to work which gives a small material recompense.

"The Capital City" was proposed by J. A. Westman. He assured the club that although he was not a university man, he, as well as Regina's business men as a whole, was in sympathy with such worthy aims as those of the club.

He remarked that it must not be forgotten that Regina had already a high standard of primary and secondary education and had a flourishing college. Everything that would further educational ends would be welcomed by all business men of the city, who, he believed, had the highest interests of the city at heart, and through whose efforts chiefly the carrying out of those aims is made possible.

In reply Magistrate Trant pointed to the responsibility

which rested on university graduates in upholding a worthy standard of citizenship, which has always been placed before them at the university. The spirit and tone of the new universities of the West would be deeply influenced by the spirit of the older universities as revealed in their graduates.

"The University Club" was proposed by Mr. R. E. W. Hagarty, who remarked that the aim of a club such as this one was a complete and sufficient justification for its existence.

In reply, the president of the club, Dr. M. R. Bow, stated that, broadly speaking, the aim of the club was to keep alive and strengthen those university ideals which college men are in danger of losing, particularly in this Western country, and to promote a stronger feeling of brotherhood among the graduates of the city. The club will welcome all who feel a wish for this closer union.

The "School" men present were: Messrs. D. A. Smith, '04; W. A. Begg, '05; H. G. Phillips, '07; R. E. W. Hagarty, '07, and L. S. Cockburn, '10.

THE ENGINEERING SOCIETY ELECTIONS

MARCH 15TH, 1912

If one but stops to think he will realize that the changes which have taken place at the School within the last four years are tremendous. The greatest change, of course, is that of the different courses now extended to four years, in the place of the three as hitherto, with the degree of B.A.Sc. at the end of the course. To the influence of this great change, involving as it does the complete reconstruction of the curriculum of each one of the departments, no doubt most of the other changes have to look for their growth.

Now, to one of the old guard, the elections also are greatly changed. They are not quite the same as in the old halcyon days. There was never a better place to hold the elections than in the dear old red brick building, with "Home Sweet Home" so artistically painted at the northern door, the spirit of which few words was so well felt in the days of the classes Naughty-Five to One-ty-One, and before, perhaps. It won't be a great while now before this fond old pile of renovated bricks and mortar becomes a dream of the past and a new building poses in its place, formed as a result of the figuring of the "strong" trio, "John MaC." "C.R." and "Peter." How the floors ran with water from the fire-hose, and how big drafting room "A" rang with the cheers and the yells, never to resound again as they did on the old election nights, will for many a day be fondly cherished in the memory of those who have gone out, to be sadly recalled on returning in the future days when we come back to make a call.

Even next year there will be no gym. in which to hold the elections, and the memory of those few elections, that have been

pulled off there, will be carefully laid away in the cupboard of fond recollections.

Things are getting tamer. There can be no doubt of it. It is not many years since voting was only held in the evening and, in order to poll a vote, a man had to run the gauntlet, and as we remember it, it was more than a few small laths and bladders which fell upon him in his course.

This year's elections witnessed the growth and expression of some entirely new platforms, wonderful as it may seem. Old platforms that have existed since the antediluvian days (the days of hoses and three X), such as individual lockers, smoking and reading rooms, etcetera, appeared to be somewhat in the background this year due to new platforms such as: private hospital wards with free attendance for School men; protection by statute of the engineering professions. The latter platform was the one, along with the proposed petition as to School men being permitted to qualify as fire rangers, upon which Mr. J. E. Ritchie was elected as president of the Engineering Society for the coming year.

The elections included this year similar features to those of previous years and some new ones. Tobacco, pipes, fruit, and even sandwiches, were handed out as a reward to those passing through the Mills of the Gods, the Brute Force Committee. An excellent programme was carried out, assisted by the famous School orchestra, under its genial leader, Mr. John Temple, ('11), which was such a fine innovation and so popular that the members of the orchestra were not even allowed to leave their instruments for the time that it would take to go and obtain some fruit. Certainly great credit is to be given to Mr. Temple for his work, which extended over the whole year, and the results produced must have proved gratifying to him.

The basket ball and hockey games (the latter on roller skates and with brooms), and other games, were carried off very nicely, along with the appearance of a bogus School octette, which, as a singing organization, was a failure (the writer being a member of it), but which amply proved its worth as a drawing card for the lemons which were projected from the gallery and elsewhere in the shape of apples and oranges and the remnants of such. However, the "octette" was compensated for the worthy efforts put forth in practice (?) and production, by a beautiful bouquet presented by one of the prominent members of the outgoing executive in the shape of one of the poor wee mutilated flowerlets so ignominiously "pinched" at the Fourth Year Dinner held earlier that evening at the Engineers' Club.

A new and taking innovation at the elections was the presence of a number of very sweet and charming young society belles, whose names, unhappily, were lost in the introduction due to the mob of courteous and well-dressed young gentlemen who waited upon these fair damsels, passionately craving dances and other favors. Never were the ladies so alarmingly popular or so gorgeously decked. These beautiful young ladies were dressed in the very latest from

Paris, *à la décolleté*. One young lady who is certainly worthy of mention was the possessor of one of those beautiful picture hats that Miss Clay so raves over, a most magnificent bunch of garlic, and bunches of other lovely flowers, being painted thereupon, reminding one of the romantic and touching little ballad, entitled "Roses May Die and Violets May Die, but Garlic Lives Forever."

The "Toike Oike," the famous School election journal originated a year ago by Professor Stiles ('07), now of the University of New Brunswick, was published with Mr. P. G. Cherry ('11), as editor-in-chief. It proved to be a satisfactory and an invaluable part of the elections.

When the smoke finally lifted the new executive was found to be made up of the following members:

President, J. E. Ritchie.

1st vice-president, Wm. Curtis.

2nd vice-president, Civils and Architects, F. S. Rutherford.

2nd vice-president, Miners and Chemists, G. M. Smyth.

2nd vice-president, Electricals and Mechanicals, M. F. Verity.

Treasurer, H. R. MacKenzie.

Corresponding Secretary, C. C. Rous.

Recording secretary, J. M. Macdonald.

Curator, G. Rankin.

4th Year representative, H. Hawley.

3rd Year representative, H. N. Macpherson.

2nd Year representative, T. W. Crane.

1st Year representative, to be elected.

LETTER TO DEAN GALBRAITH

Vancouver, B.C., March 11th, 1912.

Dr. J. Galbraith,

Dean, Faculty of Applied Science and Engineering,
University of Toronto, Toronto, Ontario.

Dear Sir:—

It is with pleasure that as secretary I advise you that the Engineering Alumni of the University of Toronto, Pacific Coast Branch, was organized on the 20th of January, 1912. The graduates of the School of Practical Science on the Pacific Coast have long felt that there was such an organization needed, and that it would be to the advantage of the "School" and themselves to have the same formed, but it was only recently that they felt they were numerically strong enough to carry it out.

The idea of the Alumni, apart from the social advantages to its members, is to advance the interests of the Faculty of Applied Science and Engineering of the University of Toronto, to advertise the same on the Pacific Coast, to encourage engineering students from this locality to attend the "School," and to render

any assistance to graduates or undergraduates of the Engineering Faculty of the U. of T., who may come or contemplate coming to the Pacific Coast, in familiarizing them with engineering conditions, and, should it be possible, to inform the Faculty in Toronto of any matters coming under our notice conducive to the welfare of the "School," and to supply any information obtainable which the Faculty might desire with reference to this locality.

Should you be pleased to advise the Engineering Society and any of the other societies of the "School" of the organizing of this Alumni, you may also advise them that the secretary here will be pleased to furnish any information which he can to any of the students or graduates with reference to the engineering conditions on the Pacific Coast. A list of the addresses of the members of the Engineering Alumni will be sent as soon as the same is compiled.

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With best wishes to yourself and to the Faculty, and for the prosperity of the "School."

Yours very truly,

N. R. ROBERTSON,
Secretary-treasurer.

REVIEWS.

The Manitoba Engineer.

"Applied Science" begs to voice a word of welcome to a new contemporary, "The Manitoba Engineer," published by the Engineering Society of the University of Manitoba. Volume I, No. 1 appeared in March.

The journal has a sprightly and well-balanced appearance, and will fill an important place in the Engineering Faculty of that University. The initial number contains articles covering a wide range of engineering subjects. Among them are: "Stresses in Eccentrically Loaded Columns"; "Electric Arcs," an article on "Manitoba Highway Building," and several dealing with Winnipeg's progress in engineering.

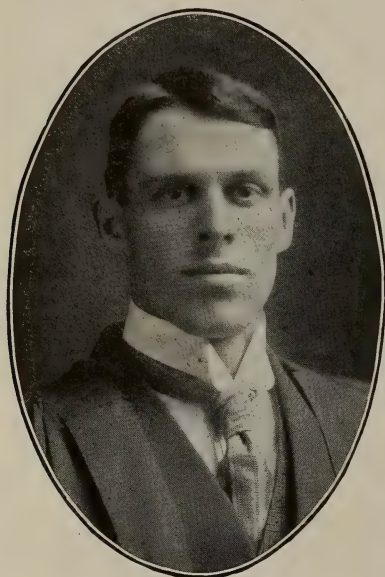
Engineering.

In the issues of "Engineering" (London), for February 23rd and March 1st, appears an illustrated article by Robert W. Angus, Professor of Mechanical Engineering, University of Toronto, descriptive of the Mechanical Engineering Laboratories of this University. The writer has described the arrangement of machinery and plant, individually and collectively, in a very comprehensive manner, citing the advantages and disadvantages that have made themselves apparent in the design and operation of this magnificent laboratory.

OBITUARY

C. O. Hay.

Charles Oliver Sutcliffe Hay was born on the May 13, 1881, at Falkenberg, Ont. In 1900 he entered Pickering College and graduated from there in 1903. The following three years he spent



CHAS. O. HAY, '09.

with his father in Falkenberg, being engaged in the lumber business. In 1906 he entered Civil Engineering at the Faculty of Applied Science in the University of Toronto. Here he proved himself an all-round man, his splendid physique enabling him to take a very active part in athletics. He played for the junior, intermediate and senior School rugby teams, and also with the Varsity III. and II. teams.. Graduating in 1909, he left the University well known, and liked by the many who knew him. He then worked for the contractors on the Hydro-Electric Commission as foreman on tower erection, and was promoted to divisional superintendent on construction. In January, 1911, he married Miss Rose Sloan of Toronto, and then went to Montreal as

assistant divisional engineer for the Shawinigan Power Co. At Riviere des Prairies, while engaged on this work he contracted typhoid fever, and after a short illness died on Sept. 5th in the Western Hospital. His death is a great loss to his many friends and fellow-workers, for he was, wherever he went, universally liked and respected. The engineering profession has lost a man who was a credit to his calling and who would, of a surety, have made his mark. Our sympathy is extended to his young wife, who has so early suffered such a great loss, and to his father, mother and sisters, for he was an only son and brother.

N. D. Whatmough.

The great Porcupine disaster of last summer was brought vitally home to us by the death therein of Norman Whatmough,

of the class of '14. Mr. Whatmough was a student in mining engineering, and at the close of the term, went north, engaging in mining work at the Dome Mine. Along with others, he took refuge in a shaft, only to be suffocated by the fumes of the holocaust, all means of escape being cut off. He was most popular and conscientious in his school career, and the cutting short of what promised to be a most successful life, was deeply regretted by his associates and fellow-students.

Jno. E. McDougal.

It was with a shock that the many friends and acquaintances of "Jack" McDougal heard of his death by drowning on the 20th May last, while attempting to paddle up the "Narrows," a dangerous portion of the Back River, the northern branch of the St. Lawrence, at Montreal. Mr. McDougal was born in 1887, and received his public school training at Gladstone School, subsequently attending for a year. He then entered the employ of the Toronto Street Railway, and remained with that company for several years. Desirous of bettering his position, he decided to study engineering, and with this in view, in 1905 he entered the Toronto Technical School, taking a special course and obtaining, in the following year, his matriculation standing with honors. He entered the Faculty of Applied Science to study mechanical and electrical engineering, with the class of '09. Here his sterling qualities and genial disposition made him a general favorite. Here also he further bore out his reputation as a student by taking, with ready facility, his successive examinations with honors. In the interim between college terms he was employed in the engineering department of the City of Toronto, and in the fall of



JNO. MCDUGAL, '09.

1909 took a position with the Expanded Metal Company. They quickly appreciated his abilities, and sent him to Montreal as their Eastern representative. His untimely death cut short a career which gave every promise of being an exceptionally brilliant one. To his large circle of friends, however, there remains a memory of a buoyancy, and an optimism, that was a pleasure to all with whom he came in contact. The heartfelt sympathy of his classmates is extended to his bereaved parents, to whom he was an only son.

Benjamin J. Redfern.

Particularly sad are the circumstances surrounding the death at the early age of 27 years of Benjamin J. Redfern of the class of '10. Mr. Redfern, the son of Mr. and Mrs. Thomas Redfern of



BEN. J. REDFERN, '10.

Holly, Ont., received his early education at the Big Bay Point schools and afterwards attended the Barrie Collegiate Institute. He began teaching school at the early age of 17 years, but later took up telegraphy and secured a position with the Grand Trunk Railway. Being of a studious and industrious nature, his interest in electrical engineering resulted in his entering the Faculty of Applied Science and Engineering, from which he graduated in 1910. Upon leaving the University he took up editorial work on "Construction" journal, and later secured a position with the Toronto Hydro-Electric System, which position he retained until a short time prior to his death, caused by tuberculosis of the throat. Mr. Redfern, during

his course in the University of Toronto, displayed himself to be of such true manliness and genial disposition which, accompanied by the qualities that promise the ideal engineer as well as man, created in the hearts of his fellow-students a friendship which time will not easily efface.

James Newark Leitch.

Mr. J. N. Leitch, of the class of '10, died on March 24th, 1912, after an illness of several days' duration, having contracted pleurisy which was soon followed by pneumonia. Mr. Leitch was the younger son of Chairman James Leitch of the Ontario Railway and Municipal Board. He graduated from the Faculty of Applied Science and Engineering in 1910, and secured the degree of B.A.Sc. last year. Since enrolling as a student in the University, Mr. Leitch has displayed unusual ability in engineering work, and his summers have been spent in the furthering of his course and extending as far as possible the value of his academic training. The holidays of 1908 he spent on construction work on the Grand Trunk Pacific. His summer of 1909 was devoted to further practical work on the T. & N. O. lines. He spent the vacation of 1910 in the employ of the Ontario Government as structural engineer in the erection of steel bridges. After leaving the University in 1911 he was employed in the Porcupine district. While making a portage with a survey party, he sustained a knee sprain which compelled him to return home, thereby escaping the Porcupine holocaust of last summer by a margin of two days. Prior to his recent illness he was employed as structural engineer on the Government House, Toronto, and was in perfect health until several days before his death. The remains of Mr. Leitch were conveyed to Williamstown, Glengarry, the scene of his boyhood days, for interment.



JAS. N. LEITCH, '10.

W. R. Davis, '13.

Mr. W. R. Davis, a member of the class of '13, died at his home in Toronto, on June 12th, 1911. Mr. Davis enrolled in the civil engineering course after having spent a year in the

Engineering Faculty of the University of Manitoba. Towards the end of the session last year, he seriously injured his knee while playing basketball, he being a member of the First Team. The injury prevented him from trying his examinations in April. Mr. Davis went West as instrument man on a Grand Trunk Pacific survey party, but contracted serious illness, which laid him up in Calgary hospital for some time. As soon as his strength permitted, his father had him brought home by easy stages and careful traveling. Mr. Davis did not regain strength, however, and died ten days after his arrival in Toronto. To his relatives we extend most heartfelt sympathy.

W. T. S. Ruston.

Mr. Wilmott T. S. Ruston, of the class of '14, electrical engineering, died at his father's residence in Nortonville, near Brampton, Ont., on Jan. 17th, 1912. Pneumonia was the cause of his early death. Previous to entering upon his University course, Mr. Ruston taught in the public schools for a number of years, but he finally decided to take up engineering as a profession. Although but one year of his course was accomplished, he showed singular ability as a student, securing honors at his examination, and was popular among his fellows. In the academic year he unfortunately injured his foot, which later caused serious development, sufficient to necessitate its amputation. It was considerable time before his health was regained, but he was on the road to favorable recovery when he suffered a fatal attack of pneumonia.

UNIVERSITY OF TORONTO CLUB OF NEW YORK. Banquet.

The 10th annual banquet took place on Saturday, Feb. 10th, 1912, in the Engineers' Club, 32 West 40th St., and a very enjoyable dinner of fifty it proved to be.

Professor W. J. Alexander and Professor C. H. C. Wright greatly pleased the members with their entertaining speeches. Professor Alexander having already made a great impression on the members of the Republican Club, the chairman of which, hearing that Professor Alexander from Toronto was present, called on him for a speech which, when given, pleased all.

At the banquet the Rev. Karl Reiland of St. Andrews' Church, Yonkers, made a powerful and humorous short address, and was followed by the Rev. Madison C. Peters.

Dr. A. H. Montgomery, president of the club, presided, and also called on Mr. Andrew B. Humphrey of the American Peace and Arbitration League, and E. R. L. Gould for addresses in their usual well turned style.

The Canadian Club of New York was represented by Vice President, E. Medley Scovil; the president of the Canadian Club being also present, as a member of the University of Toronto Club. The New York Graduates' Society of McGill University was represented by Mr. Wickware, while Dr. Robert G. Moore, president of the New York Society of Queen's University, did the honors for Kingston. Our Walter H. Robinson very kindly looked after the musical program and sang several very fine solos himself.

Annual Meeting.

The annual meeting was held in the Engineers' Club, taking place on Thursday, April 11th.

Twenty-seven sat down to a very pleasant dinner in the breakfast-room of the club, and then proceeded with the routine business of the club—electing the following officers for the ensuing year:—

President—Dr. Chas. Graef.

Vice-President (Eng.)—L. L. Brown.

Vice-President (Med.)—Dr. C. J. Patterson.

Vice-President (Art)—C. M. Keys.

For Membership Committee for 3 years—Dr. R. G. Snyder.

Sec.-Treas.—T. Kennard Thomson.

The principal new business transacted was the election of Professors W. J. Alexander and C. H. C. Wright to be Honorary Members of the Club. It was then decided to have the Annual Meeting in the future on the fourth Thursday in April, instead of the second.

The Secretary-Treasurer's report showed the most successful year in the history of the Club.

The meeting then adjourned into the adjoining room, where Mr. John S. Thomson played the piano and the members enjoyed singing the songs of their youth.

T. KENNARD THOMSON,

New York, April 16th, 1912.

Sec.-Treas.

G. E. Woodley, '10, is in the transformer department of the Westinghouse Electric Mfg. Co., Pittsburg, Pa. We are pleased to note that Mr. Woodley still maintains his prestige on the cinderpath and has recently won honors at an athletic meet in Pittsburg.

W. M. Carlyle, '10, is secretary of the firm of Carlyle & Beck, Limited, general contractors, Toronto. This firm makes a specialty of reinforced concrete, foundation work, diving and underwater work.

Gordon Kribs, '05, is engineer for the Pacific Coast Power and Light Co., at Portland, Oregon.

W. S. Pardoe, '04, is associate Professor of Civil Engineering, University of Pennsylvania, Philadelphia, Pa.

TREASURER'S REPORT

Engineering Building, University of Toronto.
March 30th, 1912.

The Engineering Society,
University of Toronto, Toronto, Ont.

Gentlemen: I beg to submit herein the financial statement of the University of Toronto Engineering Society for the fiscal year ending March 30th, 1912.

Cash Book Balance

RECEIPTS.

Merchandise Sales	\$ 8,107.96
Applied Science..	1,498.64
Fees	750.00
Telephones*	15.50
Annual Dinner	309.80
Annual Dance	547.00
From 1910-11 Executive.. ..	761.58
Outstanding Cheques, March 30, 1912	1,009.73
	<hr/>
	\$13,000.21

*Telephone banks withdrawn Dec. 30th, 1911

DISBURSEMENTS.

To 1912-13 Executive, Cash	\$ 785.68
Supply Department—	
Merchandise	6,806.30
Salaries	1,133.67
Applied Science... ..	1,809.40
Meetings and Entertaining	349.33
Annual Dinner	678.16
Annual Dance	568.20
Telephones	112.00
Sundry Expense.. ..	317.39
Accounts Unpaid, March 31, 1911	440.08
	<hr/>
	\$13,000.21

RESOURCES.

Merchandise as per Inventory, March 30, 1912	\$2,206.72
Cash on Hand	280.79
Cash in Bank	504.89
Accounts Due Supply Department	69.38
Accounts Due Applied Science... ..	835.99
Fees Outstanding	40.00
Office Equipment, Less 10 p.c. Depreciation	220.37
	<hr/>
	\$4,158.14

LIABILITIES.

Accounts Outstanding Supply Department	\$ 107.50
Accounts Outstanding Applied Science.. ..	82.08
	<hr/>
	\$ 189.58
Surplus	\$3,968.56

Respectfully submitted,
C. F. ELLIOTT.

APPLIED SCIENCE

INCORPORATED WITH

Transactions of the University of Toronto Engineering Society

DEVOTED TO THE INTERESTS OF ENGINEERING, ARCHITECTURE
AND APPLIED CHEMISTRY AT THE UNIVERSITY OF TORONTO.

Published monthly during the College year by the University of Toronto Engineering Society

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EDITORIAL

With this issue Volume V. of "Applied Science" is completed, and it goes to its readers with the same reminder as often repeated hithertofore. Being the School Man's Journal, first and foremost, with the bringing to his eye the product of engineering ability as an aim constantly before it, "Applied Science" sets itself the task of awakening the interest of every graduate in what is being said and done in the Engineering Faculty of this University, and of maintaining the active student interest, when student days shall have become a page in the Past. To this end, no lapse in its yearly publication is to henceforth appear, but month by month throughout the summer, it is to go out as during the college year. The retiring executive of the Engineering Society saw fit to begin this work at once and wisely so. Volume VI. will therefore begin with the month of May.

Throughout the past year an effort has been made to include in the issues of the Journal articles commanding the attention of all graduates. The policy will be continued, but, under a broadened character, broadened to include items of engineering interest for all our men, and biographical notes upon the careers of our graduate engineers. This feature will be adopted for manifold reasons. Classmates will enjoy news and recollections of each other, and of the School man's trend in general. To the undergraduate, and to the younger graduate as well, these biographies will be of greatest value, revealing to them old versus new methods in the practice as well as the teaching of engineering.

Watch, then, for the May issue and likewise for an issue each month in future. If there is not a regular monthly appearance of this Journal in your mails, it will be evident to you that we are not the recipients of latest information as to your location and attitude toward the publication.

As announced in the December issue, the funds for research scholarships to be supplied by the Engineering Alumni Association are sufficient to maintain two scholarships to the value of approximately \$500 per annum in the University of Toronto laboratories for the next three years. Up to the present time no active research work has been done. It will be remembered that Mr. W. P. Dobson was mentioned as an acceptable applicant, his chosen work being an investigation of the dielectric strength of transformer oils. The amount of labor necessary to collect all data upon the subject has been great, as Mr. Dobson and the Superintending Committee are not desirous of spending time, labor and money on clues that have been already followed up to futility or discovery. Nothing, therefore, has been accomplished experimentally.

The result is that applications for research scholarships should receive every attention, as the summer months are needed in all probability for the preparation and collection of data, in order that laboratory work may be commenced in the autumn. The time is at hand for those men who have long wished for opportunities of research work in the Faculty of Applied Science, to present their problems and request consideration. Preference will, it is understood, be naturally given to applicants who have completed the four-year course, but, in any case applications from graduates of three years' standing are entitled to, and will receive the consideration that each proposal warrants.

Two research scholarships, properly launched at the beginning of next term, will mean a great deal to the Faculty of Applied Science. The realization of the value of research has heretofore come to us as the accomplishments of other men in other countries. In our institutions of learning, scientific investi-

gation is away behind what it should be, and this is more lamentably evident in this Faculty of this Canadian University, in view of the fact that engineering practice presents so many problems, the study of which would be extremely interesting and the results of which study might be exceedingly beneficial.

It is admirable that the engineering staff of this University, and the Engineering Alumni Association, possess such an enthusiastic co-operative spirit relative to these scholarships. It evidences encouraging assistance in every possible way for the investigator, which factor he will learn to consider as next in necessity to his own untiring investigative spirit.

One section of this issue devoted to new addresses of our graduates since April, 1911, gives the impression that School men are not prone to ignore opportunities. Upwards of 700 names appear. This gives an idea, a justifiable one, that keeping up-to-date the whereabouts of our graduates amounts to no small task. It is the difficulty of again locating a man after he has changed his location, that is, of course, the important feature. How this work would be minimized if he would notify us immediately of the change! He could at the same time make mention of the new work at which he expected to be engaged, thereby dispensing with the trouble of responding several times a year to our call for information regarding nature of employment. Under penalty of being guilty of magnifying matters trivial, we repeat our request. Afford mutual assistance to reader and publication by keeping us informed of your latest address.

A number of addresses are unknown, as indicated by bold type. Any information that a reader can supply us with as to these men, will be of great assistance.

In the year 1896 the University of Toronto passed a statute establishing Professional Degrees in Civil, Mining, Mechanical and Electrical Engineering.

Candidates for any of the said degrees were required, in addition to three years' professional experience, to hold the Diploma of the School of Practical Science and also the Degree of B.A.Sc. The latter requirement being imposed upon those only who graduated from the School subsequent to June 1895. Since the passing of the above act a large number of men have graduated, who through their professional activities, have found it impossible to meet the latter requirement of the statute. Some of those of this number have turned their attention to other activities and many have already made good in their profession, and it has been felt that at least a measure of relief should be given to the situation. The University, therefore, recently

PROFESSIONAL DEGREES IN ENGINEERING

amended the statute by changing the date up to which the B.A.Sc. degree would not be required from June 1895 to June 1905. By this amendment statutory difficulties, at least in the way of proceeding to a professional degree, have been removed from about 190 graduates.

THE ENGINEERING ALUMNI, PACIFIC COAST BRANCH

On another page appears a letter written to Dean Galbraith by the secretary of a new association in British Columbia. The graduates of the Faculty of Applied Science on the Pacific Coast have strongly organized, with aims among which are the following:

(1) The bringing into closer touch with each other and with the "School" of the graduates and undergraduates on the Pacific Coast.

(2) The rendering of any possible help to "School" men newly arrived in British Columbia, in familiarizing them with existing engineering conditions there.

(3) The permanent registration of all "School" men on the Pacific Coast with the secretary of the organization, and of all "School" men, graduates or undergraduates, arriving in the vicinity.

(4) The membership not to be limited to graduates, but to undergraduates as well.

At an informal, well-attended, and most enjoyable dinner, held in Vancouver on January 20th, 1912, the work of organization was carried through, with the enthusiasm characteristic of undergraduate days at the "School," backed by the expansion of foresight and judgment derived from later years.

At this meeting, after reminiscent addresses from such men as E. B. Hermon, '86; W. A. Clement, '89, and C. E. Cooper, the business was proceeded with and the objects discussed. The following executive was appointed: President, Mr. E. B. Hermon; vice-president, Mr. K. A. MacKenzie; secretary-treasurer, Mr. N. R. Robertson, 202 Winch Building, Vancouver, B.C.; directors, Messrs. W. A. Clement, J. D. Mackenzie, and J. A. Walker. Others present at the meeting included Messrs. C. E. Cooper, '99; A. P. Augustine, '07; D. O. Wing, '08; D. Graham, '09; F. Broadfoot, '06; A. N. Wolverton, ' ; W. G. Swan, '05; P. Buchan, '08; J. E. Lavrock, '98; L. E. Jones, '11; F. R. Smith, '07; C. T. Hamilton, '07,; and J. H. Self.

The motion to adjourn was followed by "a hearty 'Toi ke Oike,' from throats rusty in the art."

Saturday evening, May 30th, was the occasion of a second gathering of School men in Vancouver, about 50 of whom were in attendance. Mr. E. B. Hermon, the president of the Alumni, was toastmaster. The toast to the "Old School" was responded to by Mr. J. H. Kennedy of '82, chief engineer of the Great

Northern Railway. The president replied to the toast of the "Engineering Profession." Other respondents to similar toasts were: Mr. W. A. Clement to the "Canadian Society of Civil Engineers"; Mr. R. Thomson to the "Canadian Mining Institute"; Mr. George Haynes, city engineer of North Vancouver, to "Municipal Engineering"; Mr. A. P. Augustine to the "British Columbia Land Surveyors"; Mr. James Hartney to the "Electrical Engineers"; Mr. L. E. Jones and Mr. F. T. Smith to the "University of Toronto," and Mr. K. A. Mackenzie to the "General Engineering Alumni of the University of Toronto"; Mr. F. Broadfoot to the "American Society of Civil Engineers," and Mr. J. A. Mackenzie to the "American Society of Mining Engineers"; Mr. Fyfe and Mr. Broadfoot to "Athletics." The Alumni took the occa-



UNIVERSITY OF TORONTO ELECTRICAL CLUB

Top row—R. A. Story, C. A. Webster, C. C. Rous.

Bottom row—R. J. Allen (Vice Pres.), F. C. DeGuerre (President), P. G. Welford (Sec.-Treas.)

sion in the University Club to present to the club a handsome picture of the University of Toronto, main building, Dr. Wilson, the president of the club, replying in a very appropriate manner.

This Pacific Coast Branch of the Engineering Alumni has expressed its keen desire to co-operate with the Faculty of Applied Science, and with the various societies connected therewith, for the advancement in every possible way of the interests of the engineering branch of the University of Toronto. It is another addition to already existing branches, all of which have before them the well defined aims that spell the betterment of engineering in Canada, through the channels of the University of Toronto. The Western organization is not disposed to slight any feature of the undertaking, the importance of which is fami-

liar to all graduates in that vicinity in its manifestation, and every "School" man within supporting distance is in duty bound to lend his aid in the common cause, upon which our other graduate organizations, our undergraduate societies, viz., the Engineering Society, the Electrical Club, the Architectural Club, the Industrial Chemical Club, and others, are bent. The Faculty of Applied Science is well aware of these strengthening influences, which are making themselves felt, and the lusty endeavor is warmly appreciated and admired throughout the whole university and its alumni.

ALUMNI MEETING IN TORONTO.

The annual meeting of the Engineering Alumni Association, Toronto Branch, was held at the Engineers' Club on Friday evening, March 29th. The usual attendance marked the event and upwards of four hours were spent in the discussion of topics pertaining to progress in the Faculty of Applied Science.

Professor G. A. Guess, of the Department of Metallurgy, was the guest of the evening, and addressed the Alumni briefly upon the undesirable trend that many branches of engineering are fostering, in permitting secrecy of processes, etc., the publication of which would be of great assistance to industry. The speaker exhorted his audience to uphold and support the movement for free interchange of ideas among engineers, and particularly among the members of the mining and metallurgy branches.

The annual election of officers was part of the evening's proceedings, the Executive Committee for the ensuing year consisting of: Messrs. G. R. Mickle, '88; E. W. Oliver, '03; E. A. James, '04; J. C. Armer, '06; T. H. Hogg, '07; and H. Irwin, '09.

The president of the Alumni, Mr. W. E. Douglas, '02, presided at the meeting.

JUST OFF THE PRESS

Specification and Agreement Writing.

A reprint of the recent series of articles in the "Canadian Engineer," by Mr. C. R. Young on the "Principles of Specification and Agreement Writing," and which contains the gist of the special course of six lectures in the subject given to the Fourth Year, is now on sale at the Supply Department of the Engineering Society. The price to graduates is twenty-five cents, and to undergraduates fifteen cents, postpaid.

F. J. Anderson, '07, and W. H. Barry, '09, are carrying on a consulting practice at Niagara Falls, Ont., under the firm name of Anderson & Barry, engineers and surveyors.

C. S. L. Hertzberg, '05, until recently structural engineer with the Trussed Concrete Steel Co., has engaged with the Bishop Construction Co. at their Toronto office.

CHANGES OF ADDRESSES

This is not a complete list of addresses. It contains only those addresses that are new since April, 1911, in which number of APPLIED SCIENCE a then complete list was published. Graduates are requested to inform us immediately of changes in their addresses.

1882

1. D. JEFFREY.....Unknown.

1883

1. G. H. Duggan, M.Can.Soc.C.E.....Montreal, P.Q.
Dominion Bridge Co.

1884

1. W. C. KIRKLAND.....Unknown.

1886

1. H. G. Tyrrell, C.E., A.M.Can.Soc.C.E. ..Evanston, Ill.
Consulting Engineer.

1887

1. A. E. LOTT.....Unknown.
1. F. MARTIN, M.B., O.L.S.....Unknown.
Physician

1888

1. D. B. BROWN, O.L.S.....Unknown.

1889

1. B. CAREY.....Unknown.
1. W. J. Chalmers.....Vanport, Beaver Co., Pa.
1. G. F. Hanning.....St. Eustache,
Div. Engineer C.N.R. Two Mountains P.Q.

1891

1. W. B. Russell.....1307 Traders Bank Bldg.,
Civil Engineer and Contractor. Toronto Ont.

1892

1. J. R. Allan, O.L.S.....Renfrew, Ont
1. A. G. ANDERSON.....Unknown.
1. J. B. GOODWIN.....Unknown.
5. W. L. Lawson, B.A.Sc.....Sterling, Colo.
Manager, Great Western Sugar Co.

1893

1. C. Forrester.....Indian Head, Sask.
1. T. J. McFarlen.....Port Arthur, Ont.
Chemist, Atikakan Iron Co.
1. A. J. McPherson, B.A.Sc., D.L.S.....Regina, Sask.
City Commissioner.
1. W. MINES, B.A.Sc.....Unknown.
1. W. V. TAYLOR, O.L.S., A.M.Can Soc.
C.E.....Unknown.
1. R. B. WATSON.....Unknown.

1894

1. H. F. Barker.....Toronto, Ont.
Godson Contracting Co.
1. A. T. Beauregard, B.A.Sc.....Verona, N.J.
*Laboratory Engineer, Public Service
Corporation of New Jersey.*
3. W. J. HERALD, B.A. Sc.....Unknown.
1. S. M. Johnston, B.A.Sc., P.L.S.....Trail, B.C.

APPLIED SCIENCE

1. J. E. Jones.....149 Broadway, New York, N.Y.
1. **A. L. McTAGGART, B.A.Sc.**.....**Unknown.**
1. H. Rolph.....Lachine, P.Q.

1895

1. E. J. Boswell, D.L.S.....Montreal, P.Q.
Engineering Dept., C.P. Ry.
3. **W. M. BRODIE, B.A.Sc.**.....**Unknown.**
4. R. J. Campbell.....Chicago, Ill.
Western Electric Co.
1. F. W. Guernsey.....Trail, B.C.
3. **H. S. HULL**.....**Unknown.**

1896

2. L. T. Burwash.....White Horse, Y.T.
Mining Recorder.
3. H. P. Elliott, B.A.Sc., E.E.....Manning Chambers
Industrial Engineer. Toronto

1897

4. E. A. Forward, A.M.Can.Soc.C.E.....Box 2966, Winnipeg, Man.
3. W. A. B. Hicks.....1833 Wallace St., Philadelphia, Pa.
4. C. F. King.....817 Blvd. St. Joseph W., Outremont, Montreal, P.Q.
Sales Manager, The Railway Asbestos Packing Co. Limited, Sherbrooke and Montreal.
2. A. H. A. Robinson, B.A.Sc., M.A.I.M.E., 497 Gilmour St., Peterborough, Ont.
3. **W. R. SMILEY**.....**Unknown.**
1. E. A. Weldon.....413 McIntyre Bldg.,
Real Estate Broker. Winnipeg Man.

1898

3. **J. E. LAVROCK**.....**Unknown.**
4. D. MacKintosh, B.A.Sc., B. Arch.....Brooklyn, N.Y.
Chief Supt., F. M. Andrews & Co.
1. **F. W. McNAUGHTON, O.L.S.**.....**Unknown.**
3. **A. E. SHIPLEY, B.A.Sc.**.....**Unknown.**
3. F. C. Smallpiece, B.A.Sc.....485 Grosvenor St., Westmount P.Q.
Assistant Manager, Canadian General Electric Co.
1. H. L. Vercoe.....109 McCaul St., Toronto, Ont.
3. D. A. Williamson, B.A.Sc.....Ottawa,

1899

2. J. T. M. Burnside, B.A.Sc.....Toronto.
2. **G. A. CLOTHIER**.....**Unknown.**
3. J. A. Craig, B.A.Sc.....Prince Albert, Sask.
2. **J. C. ELLIOTT**.....**Unknown.**
3. **W. E. FORMAN**.....**Unknown.**
3. **E. GUY, B.A.Sc.**.....**Unknown.**
3. W. Monds, B.A.Sc.....New York Athletic Club,
New York, N.Y.
3. **A. S. H. POPE, B.A.Sc.**.....**Unknown.**
3. E. Richards, B.A.Sc.....Toronto, Ont.
Purchasing Agent, Toronto Hydro-Electric System.

1900

1. J. L. Allan, A.M.Can.Soc.C.E.....Dartmouth, N.S.
Assistant Engineer, Intercolonial Ry.
3. **J. CLARK**.....**Unknown.**
3. G. W. Dickson, B.A.Sc.....Grand Mere, P.Q.
With Laurentide Paper Co.
2. H. S. Holcroft, B.A.Sc., D.L.S.....108 St. Vincent St., Toronto, Ont.
3. H. A. Johnson.....Stetler, Man.

3. J. C. JOHNSTON.....Unknown.
2. J. G. McMillan, B.A.Sc.....424 Wellington Pl., Toronto, Ont.
Mining Engineer and Geologist, T. & N. O. Ry.
2. J. R. Roaf, B.A.Sc.....Edmonton, Alta.
3. C. H. E. ROUNTHWAITE.....Unknown.

1901

3. J. T. BROUGHTON.....Unknown.
3. N. R. Gibson, B.A.Sc.....403 Markham St., Toronto.
2. A. T. E. HAMER.....Unknown.
3. W. C. Lumbers.....69 Metcalf St., Toronto.
2. W. C. MATHESON.....Unknown.
2. J. L. R. Parsons, B.A., D.L.S.....Regina, Sask.
1. G. H. Power.....108 Dovercourt Rd., Toronto
Chapman & Power.

1902

3. J. M. BROWN.....Unknown.
2. A. R. CAMPBELL.....Unknown.
2. F. T. CONLON.....Unknown.
3. H. V. Connor.....Hamilton, Ont.
Canadian Westinghouse Co.
2. W. M. Edwards, B.A.Sc.....205 Sherlock Bldg.,
Duff & Edwards. Lethbridge Alta.
2. D. L. H. Forbes.....306 Manning Chambers, Toronto.
Mining and Metallurgical Engineer.
1. A. E. Gibson, B.A. Sc.....1253 King St. W., Toronto.
3. A. C. GOODWIN.....Unknown.
3. D. M. Johnston.....107 Beatrice St., Toronto.
3. R. S. MENNIE.....Unknown.

1903

3. H. H. Angus, B.A.Sc.....Confederation Life Bldg., Toronto.
Consulting Engineer.
2. N. A. Burwash, B.A.Sc.....113 Bloor St. W., Toronto.
3. A. E. Davidson, B.A.Sc.....Niagara Falls, Ont.
3. R. E. GEORGE.....Unknown.
1. W. A. Gourlay.....Penticton, B.C.
Locating Engineer for the Kettle River Ry.
5. J. A. HORTON.....Unknown.
1. A. L. McNaughton.....Cornwall, Ont.
3. C. A. MAUS.....Unknown.
3. J. D. PACE, B.A.Sc.....Unknown.
2. J. E. Umbach.....Victoria, B.C.
With Surveyor General.
3. S. B. Wass.....Fredericton, N.B.
Constructing Department, St. John and Quebec Ry.
3. M. B. BONNELL.....Unknown.

1904

- R. J. Burley.....Calgary, Alta.
*Dist. Engineer, Irrigation Office,
Dept. of Interior.*
3. F. W. Burnham, B.A.Sc.....4132 Dorchester St. W.,
Montreal, P.Q.
3. J. W. CALDER, B.A.Sc.....Unknown.
1. A. J. Campbell, B.A.Sc.....Collingwood, Ont.
3. A. M. Campbell, B.A.Sc.....Chilliwack, B.C.
2. C. A. Chilver.....Walkerville, Ont.
2. H. L. Chilver.....Walkerville, Ont.
2. P. C. Coates, B.A.Sc.....Revelstoke, B.C.
Mining Engineer.
3. S. E. Craig.....Snelgrove, Ont.

1. A. L. Ford, B.A.Sc. Prince Rupert, B.C.
*Government Inspector, Dept. of
Railways and Canals.*
 1. J. N. Goodall. 380 Woodville Ave.,
West, Toronto, Ont.
 1. J. P. Gordon. Dauphin, Man.
Engineering Staff, Willis Chipman, C.E.
 3. W. W. Gray, B.A.Sc. Medicine Hat, Alta.
 1. E. M. M. Hill. Edmonton, Alta.
Locating Engineer.
 2. C. J. Ingles. Thorold, Ont.
 1. E. A. James. 57 Adelaide St. E., Toronto.
Engineer to York Highway Commissioner.
 1. P. V. Jermyn, B.A.Sc. 216 Poplar Plains Rd., Toronto.
C.P.R. Construction Dept.
 3. O. B. McCUAIG, B.A.Sc. **Unknown.**
 1. G. G. McEWEN, B.A.Sc. **Unknown.**
 1. W. G. McFarlane, B.A.Sc. 55 Elliott St., Toronto.
 3. C. P. McGibbon, B.A. Hamilton, Ont.
Canadian Westinghouse Co.
 1. D. McMillan. Edmonton, Alta.
 3. E. E. MOORE. **Unknown.**
 3. W. H. Munro. Peterborough, Ont.
Peterborough Radial Ry.
 3. G. PACE. **Unknown.**
 3. W. S. Pardoe, B.A.Sc. Philadelphia, Pa.
*Associate Professor of Civil Engineering,
University of Pennsylvania.*
 1. D. L. C. Raymond, B.A.Sc. Toronto, Ont.
Manager, Bishop Construction Co.,
 3. M. R. Riddell, B.A.Sc. 86 Spadina Rd., Toronto.
President, Radiant Electric Co.,
 3. S. E. THOMSON. **Unknown.**
 3. C. J. Townsend, B.A.Sc. Moose Jaw, Sask.
Wilson, Townsend and Saunders.
 2. E. Wade, B.A. Welland, Ont.
Contractor and Builder.
 1. J. M. Weir. Toronto, Ont.
Toronto Plate Glass Importing Co.
- 1905
3. C. B. AYLESWORTH. **Unknown.**
 3. G. G. BELL. **Unknown.**
 3. W. R. Carson. Cleveland, Ohio.
Grasselli Chemical Co.
 1. A. V. CHASE. **Unknown.**
 1. G. H. Ferguson, B.A.Sc. 52 Isabella St., Toronto.
Commission of Conservation.
 2. C. S. L. Hertzberg. Toronto.
Bishop Construction Co.
 3. W. G. Hewson, B.A.Sc. Niagara Falls, Ont.
 3. G. Kribs. Portland, Oregon.
Pacific Coast Power and Light Co.
 2. P. A. Laing. Dundas, Ont.
 2. D. W. MCKENZIE. **Unknown.**
 3. F. G. MACE. **Unknown.**
 3. G. R. Munro, B.A.Sc. 405 Dorchester St. W., Montreal.
 1. E. D. O'BRIEN. **Unknown.**
 1. E. P. A. Phillips, B.A.Sc., O.L.S. Oshawa, Ont.
 1. T. E. Rothwell, B.A.Sc. 607 Spadina Ave., Toronto, Ont.
 2. G. S. Scott. 125 84th St., Brooklyn, N.Y.
 3. H. V. Serson. Newark, N.J.
Engineer of Construction, Titan Steel Co.

1. H. L. Wagner, B.A.Sc. 21 Gerrard St. E., Toronto, Ont.
Structural Dept., Toronto Structural Steel Co.

1906

1. F. Alport. Redditt, Man.
3. J. C. Armer, B.A.Sc. Toronto, Ont.
Sec.-Treas., Commercial Press, Ltd.
2. G. W. Bissett. Porcupine, Ont.
Dome Mines.
1. A. E. K. Bunnell, B.A.Sc. 61 Grosvenor St., Toronto.
3. F. M. Byam. 43 Churchill Ave., Toronto.
With McGregor & McIntyre.
3. A. Cameron. Winnipeg, Man.
Vulcan Iron Works Co.
3. **A. W. CAMPBELL, B.A., Sc.** **Unknown.**
1. E. L. Cousins, B.A.Sc. 32 Laburnam Ave., Toronto.
Engineer to Harbour Commission.
1. A. L. Harkness, B.A.Sc. Montreal, P.Q.
St. Lawrence Bridge Co., Limited.
1. E. Harrison, B.A.Sc. 513 Beveridge Bldg., Calgary, Alta
Ponton & Harrison.
1. R. S. Houston. Winnipeg, Man.
Vulcan Iron Works Co.
1. A. E. Jupp, B.A.Sc. 165 Bolton Ave., Toronto.
3. J. D. Keppy. 46 Ulster St., Toronto.
Hamilton Gear & Machine Co.
3. A. P. Linton, B.A.Sc. Montreal, P.Q.
With St. Lawrence Bridge Co.
2. J. A. McKenzie. Vancouver, B.C.
1. J. V. McNab. Moose Jaw, Sask.
C.P.R. Engineering Dept.
3. J. A. McPherson. Bolsover, Ont.
2. K. A. MacKenzie, B.A.Sc. Vancouver, B.C.
1. W. MacKinnon. Wilkinsburg, Pa.
3. W. MacLachlan, B.A.Sc. Belleville, Ont.
Manager, Trenton Electric & Water Co.
3. W. A. Maxwell. 123 Fisher St., Detroit, Mich.
2. C. J. Murphy, B.A.Sc. Fernie, B.C.
Chief Engineer, Crow's Nest Pass Coal Co.
5. R. E. Pettingill. Port Colborne Ont.
Chief Chemist, Canada Cement Co.
3. N. R. Robertson, B.A.Sc. 202 Winch Bldg., Vancouver B.C.
1. **J. O. RODDICK** **Unknown.**
2. O. Rolfsen, B.A.Sc., D.L.S. Walkerville, Ont.
Dept. of the Interior.
2. J. H. Ryckman. 7323 Stewart Ave., Chicago. Ill.
Construction Dept., Chicago, R. 1. & Pacific Ry.
2. J. E. Thomson, B.A.Sc. 57 Queen's Park, Toronto. Ont.
3. **J. N. WILSON, B.A.Sc.** **Unknown.**
3. E. M. Wood, B.A.Sc. Toronto, Ont.
Engineering Dept., Canadian General Electric Co.

1907

3. H. D. Bowman, B.A.Sc. 309 Ontario St., London. Ont.
1. G. H. Broughton. Penticton, B.C.
Manager, People's Trust Co., Ltd.
1. **J. A. BROWN, B.A.Sc.** **Unknown.**
1. C. E. Bush, B.A.Sc. 156 Geoffrey St., Toronto, Ont.
1. E. Cavell. 182 Sunnyside Ave., Toronto, Ont.
Fellow in Surveying, University of Toronto.
3. G. C. Cowper, B.A.Sc. Welland, Ont.

2. **J. V. CULBERT, B.A.Sc.**.....**Unknown.**
 3. F. R. Ewart, B.A.Sc. 44 Sussex Ave., Toronto, Ont.
Smith, Kerry & Chace.
 1. J. S. Galletly Brooklin, Ont.
 1. A. Gillies, B.A.Sc. Minnedosa, Man.
 1. R. E. W. Hagarty, B.A.Sc. Vancouver, B.C.
 1. C. T. Hamilton, B.A.Sc. Vancouver, B.C.
 1. T. H. Hogg, B.A.Sc. Toronto, Ont.
Editor, Canadian Engineer, 62 Church St.
 4. C. B. Jackson Chicago, Ill.
*Chief Engineer, Estimating Dept. C.
Everett Clark Co.*
 3. D. F. Keith Toronto, Ont.
Keith & Fitzsimmons.
 1. H. P. Keith Edmonton, Alta.
*Smith & Keith, Surveyors and En-
gineers.*
 1. L. W. Klingner Smith's Falls, Ont.
Res. Engineer, C.P.R.
 1. J. H. Lindsay Hornby, Ont.
 3. D. J. McGugan, B.A.Sc. Box 231, New Westminster, B.C.
With Hill & Burnett.
 3. **F. W. McNEILL, B.A.Sc.**.....**Unknown.**
 1. M. K. McQuarrie Revelstoke, B.C.
Resident Engineer, C.P.R. Co.
 3. J. B. Minns, B.A.Sc. 102 College St., Toronto, Ont.
 1. E. W. Murray Regina, Sask.
Department of Public Works.
 3. **J. D. MURRAY**.....**Unknown.**
 1. A. E. Nourse Montreal, P.Q.
With C. W. Noble.
 1. R. B. Potter, B.A.Sc. 235 Garden Ave., Toronto, Ont.
Dept. of Roadways, City Engineer's Office.
 3. G. E. Quance, B.A.Sc. Delhi, Ont.
*Secretary-treasurer, The Delhi Light
& Power Co.*
 1. **A. C. T. SHEPPARD**.....**Unknown.**
 3. E. R. Smithrim, B.A.Sc. Watrous, Sask.
*Watrous Electric Light, Power &
Traction Co.*
 1. W. Snaith 493 Brunswick Ave., Toronto.
Assistant Engineer to Frank Barber.
 3. A. C. Spencer, B.A.Sc. Hamilton, Ont.
*Mechanical Engineer, Hamilton
Stove & Heater Co.*
 1. J. A. Stiles, B.A.Sc. Fredericton, N.B.
*Professor of Civil Engineering,
University of New Brunswick.*
 3. O. R. Thomson, B.A.Sc. Highgate, Ont.
 3. **A. F. WILSON, B.A.Sc.**.....**Unknown.**
 3. M. H. Woods Aylmer West, Ont.
- 1908
5. J. R. Arens, B.A.Sc. Orillia, Ont.
 3. H. C. Barber, B.A.Sc. 88 St. Albans St., Toronto, Ont.
 2. F. J. Bedford Lakefield, Ont.
 3. J. H. Brace 171 Harvard Ave., Montreal, Que.
 1. P. R. Brecken, B.A.Sc. 31 Howland Ave., Toronto.
 3. E. I. Brown Paris, Ont.
 2. J. E. Campbell, B.A.Sc. Coldstream, Ont.
 1. R. Y. Cory, B.A.Sc. 3 Deer Park Crescent, Toronto,
 1. F. A. Danks 544 Gladstone Ave., Toronto.

3. H. C. Doorly.....5 Geneva St., St. Catharines, Ont.
Assistant Engineer, Jenckes Machine Co.
 1. F. M. Eagleson.....Winchester, Ont.
Land Surveyor.
 1. C. Flint, B.A.Sc.....Winnipeg, Man.
Asst. Engineer, C.P.R.
 1. A. H. Foster, B.A.Sc.....Cochrane, Ont.
Resident Engineer, T.C.R.
 3. G. C. Francis.....Verschoyle, Ont.
 3. C. L. Gully, B.A.Sc.....328 Broadview Ave., Toronto, Ont.
With Toronto Electric Light Co.
 3. J. W. Hackner, B.A.Sc.....Sanford, Ont.
With Continental Rubber Co.
 5. D. J. Huether, B.A.Sc.....Torreon, Coahuila Co., Mexico.
 3. S. B. Iler.....Belleville, Ont.
Construction Dept., Midland Construction Co.
 2. H. G. Kennedy, B.A.Sc.....22 Grenville St., Toronto, Ont.
 5. K. D. Marlatt.....Oakville, Ont.
The Marlatt & Armstrong Co.
 5. G. L. Milligan, B.A.Sc.....Brampton, Ont.
 3. E. D. Monk, B.A.Sc.....Pittsfield, Mass.
Commercial Engineering, General Electric Co.
 3. F. H. Moody, B.A.Sc.....Toronto, Ont.
Mechanical Editor of Railway and Marine World.
 1. H. J. Peckover, B.A.Sc.....205 Dunn Ave., Toronto.
 3. M. Pivnick, B.A.Sc.....Maxwell, Ont.
 3. C. F. Publow, B.A.Sc.....Davidson, Sask.
 1. J. T. Ransom, B.A.Sc.....470 Manning Ave., Toronto, Ont.
Dominion Land Surveyor.
 1. W. B. Redfern, B.A.Sc.....Steelton, Ont.
 5. F. A. Robertson.....Toronto, Ont.
Canadian Inspecting & Testing Laboratories.
 1. **W. A. ROBINSON**.....**Unknown.**
 3. R. C. Robinson.....134 Edmonton St., Winnipeg, Man.
Asst. Engr. Bridge Dept., C.N.R.
 2. R. R. Rose, B.A.Sc.....473 Euclid Ave.
 3. H. F. Shearer, B.A.Sc.....Toronto, Ont.
Smith, Kerry & Chace.
 1. **J. J. STOCK**.....**Unknown.**
 3. A. D. Sword, B.A.Sc.....220 Rusholme Road, Toronto.
 3. V. C. Thomas, B.A.Sc.....28 Langley Ave., Toronto, Ont.
 1. J. H. Thornley, B.A.Sc.....Niagara Falls, Ont.
With H. D. Symmes & Co.
 3. C. P. VanNorman, B.A.Sc.....282 Carlton St., Toronto, Ont.
 1. J. A. Walker, B.A.Sc.....Vancouver, B.C.
Office of Surveyor General.
 3. B. W. Waugh.....126 Courtland Ave., Berlin, Ont.
 3. R. P. Weir.....123 Markham St., Toronto, Ont.
With Toronto Hydro-Electric System.
 3. F. D. Wilson.....60 Howard St., Toronto, Ont.
Structural Dept., Canada Foundry Co.
 1. D. O. Wing.....1116 Burrard St., Vancouver, B.C.
- 1909
3. H. V. Armstrong.....364 Victoria St., Toronto, Ont.
With W. Fry Scott.
 2. E. T. Austin, B.A.Sc.....Coniston, Ont.
Mond Nickel Co.

1. G. A. Bennett, B.A.Sc. Eden, Ont.
Dominion Land Surveyor.
3. E. R. Birchard, B.A.Sc. West Toronto, Ont.
Russell Motor Car Co.
3. D. C. Blizard, B.A.Sc. 225 Huron St., Toronto, Ont.
Engineer on Construction, Toronto Structural Steel Co.
1. W. J. Boulton. Toronto, Ont.
Post graduate course in Engineering, University of Toronto.
3. J. E. Burns, B.A.Sc. 231 Seaton St., Toronto, Ont
Assistant Manager, Maclean Daily Reports.
1. C. G. Cline, B.A.Sc. Box 429, Kamloops, B.C.
Hydrographic Survey, Dept. of the Interior.
3. W. E. Corman. Toronto, Ont.
With C. H. & P.H. Mitchell, 1005 Traders Bank Bldg.
3. T. H. Crosby, B.A.Sc. Toronto, Ont.
Demonstrator, Electrical Engineering, University of Toronto.
3. R. H. Cunningham. 82 Grange Ave., Toronto.
With MacBeth Evans Co.
1. F. A. Dallyn, B.A.Sc. 1488 King St. W., Toronto, Ont.
Engineer-in-Charge, Experimental Station, Ontario Board of Health.
1. E. M. Dann. Ottawa, Ont.
Waterpowers Branch, Dept. of the Interior.
2. A. I. Davis, B.A.Sc. Northbrook, Ont.
Superintendent, Ore Chimney Mining Co., Kaladar.
1. F. S. Falconer, B.A.Sc. 127 Slater St., Ottawa.
Dept. of the Interior.
1. J. B. Ferguson. 3302 Vernon Ave., Chicago, Ill.
3. A. T. Fergusson, B.A.Sc. 70 Madison Ave., Toronto, Ont.
3. E. R. Frost, B.A.Sc. Lachine, P.Q.
Dominion Bridge Co.
1. A. E. Glover, B.A.Sc. Edmonton, Alta.
1. J. E. Gray, B.A.Sc. Uxbridge, Ont.
1. W. H. Greene. Moose Jaw, Sask.
Assistant City Engineer.
3. C. J. Harper. Orangeville, Ont.
1. C. O. Hay (deceased)
3. J. Hemphill. Sault Ste. Marie, Ont.
Mines Dept., Lake Superior Iron & Steel Co.
3. C. R. Holmes, B.A.Sc. Detroit, Mich.
Electric Storage Battery Co.
1. G. C. Hoshal, B.A.Sc. Weyburn, Sask.
1. **A. E. HUNTER, B.A.Sc.** **Unknown.**
3. J. Isbister, B.A.Sc. Victoria Mines, Ont.
Electrical Engineer, Mond Nickel Co.
1. C. E. Johnston, B.A.Sc. 589 Bathurst St., Toronto, Ont.
1. W. J. Johnston. Vancouver, B.C.
Mackenzie, Broadfoot & Johnston.
3. W. R. Key, B.A.Sc. Toronto, Ont.
Fellow in Applied Mechanics, University of Toronto.
1. R. W. E. Loucks. Delisle, Sask.
Assistant to T. W. Brown, C.E.
1. N. C. A. Lloyd. Solina, Ont.
3. E. D. MacFarlane, B.A.Sc. Lynn, Mass.
General Electric Company.

1. J. G. MacKinnon.....Winnipeg, Man.
Optical Dept., The T. Eaton Co.
3. D. D. McAlpine, B.A.Sc.....Kakabeka Falls, Ont.
3. C. R. McCollum, B.A.Sc.....18 Hewitt Ave., Toronto, Ont.
Inspector, Toronto Hydro-Electric System.
3. A. S. McCordick, B.A.Sc.....Toronto, Ont.
Assistant Engineer, Toronto Hydro-Electric System.
3. W. G. McIntosh.....Toronto, Ont.
Post-graduate course in Engineering, University of Toronto.
- 1 V. McMillan, B.A.Sc.....North Bay, Ont.
Divisional Engineer, C.N.R.
3. N. H. Manning, B.A.Sc.....Oshawa, Ont.
1. A. B. Manson, B.A.Sc.....Ruel, Ont.
Div. Engineer, C.N.R.
1. E. S. Martindale, B.A.Sc.....Aylmer, Ont.
1. O. W. Martyn, B.A.Sc.....Regina, Sask.
Surveyor.
2. C. A. Morris, B.A.Sc.....Copper Cliff, Ont.
Mine Surveyor, Canadian Copper Co.
1. F. V. Munro, B.A.Sc.....Toronto, Ont.
City Engineer's Office.
1. E. A. Neville, B.A.Sc.....Ruthven, Ont.
1. J. Newton, B.A.Sc.....Montreal, P.Q.
3. L. S. Odell.....Calgary, Alta.
3. V. J. O'Donnell.....Toronto, Ont.
Post-graduate course in Engineering, University of Toronto.
1. A. W. Pae.....Calgary, Alta.
Davidson & Pae, Surveyors.
1. R. B. Pigott.....157 Wentworth St. S.,
Hamilton, Ont.
2. G. M. Ponton.....Calgary, Alta.
Harrison & Ponton.
1. C. R. Redfern, B.A.Sc.....Toronto, Ont.
Demonstrator in Drawing, University of Toronto.
3. L. T. Rutledge, B.A.Sc.....Toronto, Ont.
Demonstrator in Drawing, University of Toronto.
3. R. A. Sara, B.A.Sc.....Winnipeg, Man.
City Engineer's Office.
3. A. Schlarbaum, B.A.Sc.....Galt, Ont.
1. **A. SEDGWICK**.....**Unknown.**
1. B. H. Segre.....Toronto, Ont.
Post-graduate course in Engineering, University of Toronto.
1. F. V. Seibert.....Toronto, Ont.
Post-graduate course in Engineering, University of Toronto.
3. M. W. Sparling, B.A.Sc.....Trenton, Ont.
Sidney Light, Heat & Power Co.
1. N. C. Stewart, B.A.Sc.....Hazelton, B.C.
Green Bros., Burden & Co.
1. J. C. Street, B.A.Sc.....37 Breadalbane St., Toronto, Ont.
3. S. Stroud, B.A.Sc.....Toronto, Ont.
Canadian Westinghouse Co.
1. C. C. Sutherland, B.A.Sc.....446 Heiminck St., Edmonton, Alta.
1. R. G. Swan, B.A.Sc.....Kincardine, Ont.
1. A. D. Sword, B.A.Sc.....220 Rusholme Road, Toronto, Ont.
1. H. W. Tate, B.A.Sc.....Toronto, Ont.
Chas. E. Goad & Co.

3. E. A. Thompson. Lachine, P.Q.
Dominion Bridge Co.
 1. G. A. Tipper, B.A.Sc. Brantford, Ont.
Surveyor.
 3. A. G. Trees, B.A.Sc. Toronto, Ont.
Samuel Trees & Co.
 3. W. G. Turnbull, B.A.Sc. Toronto, Ont.
Chief Engineer, Turnbull Elevator Co.
 1. J. E. Underwood. Saskatoon, Sask.
McArthur, Murphy & Underwood.
 1. C. P. VanNorman, B.A.Sc. 282 Carlton St., Toronto, Ont.
 1. J. VanNostrand. 97 Delaware Ave., Toronto, Ont.
 1. C. M. Walker, B.A.Sc. London, Ont.
Dominion Land Surveyor.
 3. F. C. White, B.A.Sc. Lachine, P.Q.
Dominion Bridge Co.
 3. A. R. Whitelaw. Lindsay, Ont.
With Smith Kerry and Chace.
 5. J. A. McK. Williams, B.A.Sc. Toronto, Ont.
Fellow in Chemistry, University of Toronto.
 1. O. G. T. Williamson, B.A.Sc. 3304 S. Vernon St., Chicago, Ill.
 3. L. R. Wilson, B.A.Sc. Montreal, P.Q.
St. Lawrence Bridge Co.
 3. F. F. Wilson, B.A.Sc. Edmonton, Alta.
 2. S. A. Wookey, B.A.Sc. Porcupine, Ont.
Pearl Lake Mine.
- 1910
2. J. H. Adams, B.A.Sc. 25 Maynard Ave., Toronto, Ont.
 1. W. G. Amsden, B.A.Sc. 95 Howland Ave., Toronto, Ont.
 1. J. A. Baird, B.A.Sc. Leamington, Ont.
 1. W. J. Baird. Toronto, Ont.
*Post-Graduate course in Engineering,
University of Toronto.*
 1. H. A. Barnett, B.A.Sc. 125 Yorkville Ave., Toronto, Ont.
 2. D. G. Bissett, B.A.Sc. Porcupine, Ont.
Dome Mines.
 1. R. H. H. Blackwell. Biscotasing, Ont.
Resident Engineer, C.N.O.
 1. E. P. Bowman, B.A.Sc. West Montrose, Ont.
 2. A. F. Brock, B.A.Sc. Copper Cliff, Ont.
With Canadian Copper Co.
 3. J. R. Burgess, B.A.Sc. Havelock, Ont.
 1. G. H. Burnham. Toronto, Ont.
*Post-graduate course in Engineering,
University of Toronto.*
 3. W. C. Cale. Toronto, Ont.
*Post-graduate Course in Engineering
University of Toronto.*
 2. A. D. Campbell, B.A.Sc. Cobalt, Ont.
Engineer, O'Brien Mine.
 3. W. M. Carlyle, B.A.Sc., Toronto, Ont.
Secretary, Carlyle & Beck, Contractors.
 1. D. C. Chisholm, B.A.Sc. Winnipeg, Man.
 3. A. W. Chesnut, B.A.Sc. 71 Walker Ave.
 3. L. S. Cockburn, B.A.Sc. Regina, Sask.
Consulting Engineer.
 1. H. S. Clark, B.A.Sc. Port Dalhousie, Ont.
 3. A. G. Code, B.A.Sc. Hamilton, Ont.
Canadian Westinghouse Co.

1910—Continued

3. C. R. Cole.....Toronto, Ont.
Post-graduate Course in Engineering
University of Toronto.
1. G. A. Colquhoun, B.A.Sc.....Vankleek Hill, Ont.
4. J. H. Craig.....Toronto, Ont.
Post-graduate Course in Engineering
University of Toronto.
3. C. D. Dean, B.A.Sc.....Sarnia, Ont.
3. R. L. Dobbin, B.A.Sc.....Caron, Sask.
With W. J. Francis & Co.
3. W. P. Dobson, B.A.Sc.....Toronto, Ont.
With Hydro-Electro Power Commis-
sion.
2. V. H. Henry, B.A.Sc.....Porcupine, Ont.
Assistant Manager, McIntyre Mines.
3. W. J. Evans.....Toronto, Ont.
Post-graduate Course in Engineering
University of Toronto.
3. H. W. Fairlie.....Montreal, Que.
Northern Electric & Mfg. Co.
3. C. R. Ferguson, B.A.Sc.....Brampton, Ont.
3. J. W. Ferguson, B.A.Sc.....Lachine, P.Q.
Dominion Bridge Co.
4. J. B. K. Fiskien, B.A.Sc.....Toronto, Ont.
Demonstrator in Drawing, University
of Toronto.
1. A. W. Fletcher, B.A.Sc.....Calgary, Alta.
Surveyor.
3. F. T. Fletcher, B.A.Sc.....Calgary, Alta.
3. T. R. C. Flint.....12 Galley Ave., Toronto.
2. J. M. Foreman, B.A.Sc.....Lucan, Ont.
3. W. C. Foulds, B.A.Sc.....70 Spadina Rd., Toronto, Ont.
1. A. Fraser, B.A.Sc.....Toronto, Ont.
Fellow in Physics, University of
Toronto.
1. M. M. Gibson, B.A.Sc.....Willowdale, Ont.
With W. S. Gibson, O.L.S., C.E.
1. V. A. E. Goad, B.A.Sc.....Toronto, Ont.
Chas. E. Goad Co.
1. H. Gall, B.A.Sc.....Toronto, Ont.
With Canada Foundry Co.
3. V. S. Goodeve.....Toronto, Ont.
Canadian Westinghouse Co.
3. V. F. Gourley, B.A.Sc.....Galt, Ont.
2. R. L. Greene, B.A.Sc.....Toronto, Ont.
Parliament Buildings.
5. J. H. Harris, B.A.Sc.....Danforth Ave., Toronto.
1. N. J. Harvie, B.A.Sc.....Orillia, Ont.
3. F. G. Hickling.....Toronto, Ont.
Post-graduate Course in Engineering
University of Toronto.
2. P. E. Hopkins, B.A.Sc.....Porcupine, Ont.
Ontario Bureau of Mines.
2. F. L. James, B.A.Sc.....Tilsonburg, Ont.
1. H. C. Johnson.....Toronto, Ont.
1. R. H. Johnston, B.A.Sc.....Edmonton, Alta.
1. J. C. Keith, B.A.Sc.....Calgary, Alta.
2. J. T. King.....Toronto, Ont.
Post-graduate Course in Engineering
University of Toronto.
3. G. A. Kingstone, B.A.Sc.....Montreal, Que.
2. G. L. Kirwin, B.A.Sc.....105 St. Vincent St., Toronto, Ont.

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5. P. T. Kirwin.....Toronto, Ont.
*Post-graduate Course in Engineering,
University of Toronto.*
1. S. Knight, B.A.Sc.....Bruce Mines, Ont.
With Bruce Mines.
3. E. R. Lawler.....Toronto, Ont.
Toronto Hydro-electric System.
3. C. B. Leaver, B.A.Sc.....Toronto, Ont.
3. R. G. Lee, B.A.Sc.....Toronto, Ont.
Parliament Buildings.
1. J. N. Leitch (deceased)
3. J. B. Macdonald, B.A.Sc.....Victoria, B.C.
2. A. D. MacDonald.....Toronto, Ont.
*Post-graduate Course in Engineering
University of Toronto.*
1. J. A. Macdonald, B.A.Sc.....Ridgetown, Ont.
1. G. A. Macdonald, B.A.Sc.....Ferne, B.C.
1. A. E. MacGregor.....Toronto, Ont.
*Post-graduate Course in Engineer-
ing, University of Toronto.*
1. J. A. MacKinnon, B.A.Sc.....212 17th Ave. W., Calgary, Alta.
1. G. G. MacLennan.....Toronto, Ont.
*Post-graduate Course in Engineer-
ing, University of Toronto.*
1. D. D. MacLeod, B.A.Sc.....Calgary, Alta.
Hydrographer, Dept. of the Interior.
3. H. G. MacMurchy, B.A.Sc.....Toronto, Ont.
3. H. J. MacTavish, B.A.Sc.....57 Broadalbane St., Toronto, Ont.
4. T. C. McBride, B.A.Sc.....Moose Jaw, Sask.
1. S. G. McDougall, B.A.Sc.....Ottawa, Ont.
1. T. A. McElhanney.....Toronto, Ont.
*Post-graduate Course in Engineer-
ing, University of Toronto.*
1. J. McNiven, B.A.Sc.....Winnipeg, Man.
With Dominion Bridge Co.
3. J. I. McSloy, B.A.Sc.....St. Catharines, Ont.
2. A. W. R. Maisonneville.....Pilette's Corners, Ont.
1. N. Marr.....Toronto, Ont.
*Post-graduate Course in Engineer-
ing, University of Toronto.*
1. W. H. Martin, B.A.Sc.....Hamilton, Ont.
With Hamilton Bridge Co.
2. A. C. Matthews.....89 St. George St., Toronto.
3. H. O. Merriman.....Hamilton, Ont.
Smart Turner Machine Co.
1. D. J. Miller.....Red Deer, Alta.
Alberta Central Railway.
1. F. S. Milligan.....Toronto, Ont.
*Fellow in Mechanical Engineering,
University of Toronto.*
3. P. E. Mills, B.A.Sc.....52 Howland Ave., Toronto.
3. J. P. Morgan.....Toronto, Ont.
*Post-graduate Work in Engineering,
University of Toronto.*
1. F. R. Mortimer, B.A.Sc.....Arva, Ont.
1. A. H. Munro, B.A.Sc.....Peterborough, Ont.
3. J. C. Nash.....Toronto, Ont.
*Post-graduate Work in Engineering,
University of Toronto.*
1. V. A. Newhall, B.A.Sc.....Calgary, Alta.
*Irrigation Surveys, Department of
Interior.*

1910—Continued

2. W. E. Newton, B.A.Sc. Silverton, B.C.
Van Roi Mines.
1. F. T. Nichol, B.A.Sc. Toronto, Ont.
Asst. Engineer to Clarence W. Noble.
1. C. M. O'Neill, B.A.Sc. Erindale, Ont.
3. C. E. Palmer, B.A.Sc. Toronto, Ont.
3. G. C. Parker, B.A.Sc. Toronto, Ont.
Associate Editor, Motor Magazine.
3. K. K. Pearce, B.A.Sc. Port Hope, Ont.
3. C. H. Phillips, B.A.Sc. Buffalo, N.Y.
Chief Engineer, Howard Iron Works Co.
1. W. S. Ramsay, B.A.Sc. Montreal, P.Q.
Dominion Bridge Co.
3. B. J. Redfern (deceased)
3. C. E. Richardson Fernie, B.C.
Hydrographic Survey, Department of the Interior.
1. O. W. Ross. Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
1. W. F. B. Rubidge. Toronto, Ont.
Fellow in Drawing, University of Toronto.
3. W. C. Shaw. Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
1. W. C. Smith. Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
5. **G. E. SMITH** **Unknown.**
2. R. J. Spry. Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
2. A. L. Steele, B.A.Sc. Toronto, Ont.
Fellow in Mining, University of Toronto.
2. H. M. Steven, B.A.Sc. Porcupine, Ont.
Hollinger Mine.
1. L. I. Stone. Toronto, Ont.
Engineer Maintenance of Way, G.T.R.
3. N. C. Sherman. Esquimault, B.C.
Inspector of Ordnance Machinery.
3. A. L. Sutherland, B.A.Sc. Peterborough, Ont.
Canadian General Electric Co.
3. E. A. Ternan. Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
5. W. H. Thom. Sarnia, Ont.
Manager, Lyman Drug & Chemical Works.
3. R. M. A. Thompson, B.A.Sc. Strathroy, Ont.
3. K. M. VanAllen, B.A.Sc. 60 Bernard Ave., Toronto
1. L. T. Vennay, B.A.Sc. Brockville, Ont.
1. R. M. Walker. Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
2. T. Walton, B.A.Sc. London, Ont.
1. G. A. Warrington, B.A.Sc. Cornwall, Ont.
3. M. B. Watson, B.A.Sc. Dauphin, Man.
Resident Engineer, with Chipman & Power.

1910—Continued

3. H. M. White.....Lachine Locks, P.Q.
Dominion Bridge Co.
 4. W. S. Wickens, B.A.Sc.....Toronto, Ont.
Fellow in Drawing, University of Toronto.
 3. G. K. Williams, B.A.Sc.....147 Gore Vale Ave., Toronto, Ont.
 1. W. H. Wilson.....Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
 1. G. R. Workman.....Grand Mere, P.Q.
Assistant Engineer, Laurentide Co., Ltd.
 3. G. E. Woodley.....East Pittsburg, Pa.
Transformer Dept., West Electric & Mfg. Co.
 3. L. A. Wright, B.A.Sc.....278 Jarvis St., Toronto, Ont.
 3. A. W. Youell, B.A.Sc.....Toronto, Ont.
Fellow in Mechanical Engineering, University of Toronto.
 1. W. S. Young, B.A.Sc.....Guelph, Ont.
- 1911
5. J. Aitken.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
 1. L. B. Allan.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
 3. E. G. Archer.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
 1. L. A. Badgley.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
 1. T. H. Bartley.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
 2. H. L. Batten.....Aura Lake, Ont.
Surveyor, Barwick Morany & Co.
 1. G. L. Berkeley.....Box 62, Belleville, Ont.
 3. J. H. Billings.....Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
 2. J. R. Bissett.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
 3. W. O. Boswell.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
 1. F. Bowman.....Lachine, P.Q.
Dominion Bridge Co.
 3. T. W. Brackinreid.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
 2. W. M. Brock.....Toronto, Ont.
Fellow in Drawing, University of Toronto.
 1. W. H. D. Brouse.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
 - 3'. H. Brown.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.

1911—Continued

3. E. T. Cain.....Box 468, Lachine, P.Q.
Dominion Bridge Co.
1. C. S. Cameron.....Beaverton, Ont.
1. **C. D. CAMPBELL**.....**Unknown.**
6. W. W. Chadwick.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. R. B. Chandler.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. P. G. Cherry.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. E. F. Chestnut.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. H. J. Clark.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. F. W. Clark.....669 Spadina Ave., Toronto, Ont.
2. J. E. Clarke.....139 Dowling Ave., Toronto, Ont.
3. F. S. Cleary.....34 Crawford Ave., Windsor, Ont.
2. D. B. Cole.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. A. S. Cook.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. C. W. Cornell.....17 Charles St. E., Toronto, Ont.
1. M. E. Crouch.....Sault Ste. Marie, Ont.
With Lang & Ross.
3. W. M. Cruthers.....Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
1. O. F. Cummins.....Chepstow, Ont.
- 3'. T. J. Cunerty.....14 D'Arcy St., Toronto, Ont.
1. C. H. Cunningham.....Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
1. J. H. Curzon.....1964 Queen St. E., Toronto, Ont.
- 3'. F. K. D'Alton.....Toronto, Ont.
Post-graduate course in Engineering University of Toronto.
1. W. B. Davis.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. F. C. DeGuerre.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. F. H. Downing.....Winnipeg, Man.
Erecting Engineer, Manitoba Bridge & Iron Works.
1. W. B. Dunbar.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
5. C. H. Eckert.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. J. A. Elliott.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.

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1. G. R. Elliott.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. C. F. Elliott.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. W. M. Farquharson.....Walkerton, Ont.
1. K. A. Farrell.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. T. J. Farrelly.....Alma, Ont.
1. S. E. Flook.....Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
- 3'. C. C. Flynn.....18 Picton St., London, Ont.
5. E. L. Frankel.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. J. R. Freeman.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
2. E. E. Freeland.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
4. H. P. Frid.....409 Main St., Hamilton.
3. R. J. Fuller.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. H. D. Fyfe.....722 10th Ave., Vancouver, B.C.
5. J. L. Gooderham.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. T. G. Gravely.....733 Ontario St., Toronto.
3. R. E. Green.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. E. A. Greene.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. H. G. Hall.....Woodstock, Ont.
1. G. M. Hamilton.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
2. H. E. Harcourt.....144 Wilton Ave., Toronto, Ont.
3. M. B. Hastings.....286 Huron St., Toronto, Ont.
3. M. B. Heebner.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
2. F. I. Nelson.....Box 64, Newburgh, Ont.
Rodman, C.N.R.
3. H. R. Hill.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. A. J. Huff.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. K. Huffman.....30 Cowan Ave., Toronto.
1. H. Hyatt.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.

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1. R. H. Jarvis.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. L. E. Jones.....Vancouver, B.C.
City Engineer's Office.
1. E. A. Kelly.....119 Maryland St., Winnipeg, Man
Resident Engineer Construction, C.P.R.
- 3'. M. Kirkwood.....Toronto Ont.
Post-graduate Course in Engineering, University of Toronto.
2. J. Lanning.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. N. Lawless.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. H. L. Leadman.....Medina, Ont.
3. W. R. Lethbridge.....London, Ont.
Care of Thos. C. Knott.
2. M. Lieberman.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. G. L. Lillie.....642 Spadina Ave., Toronto, Ont.
Inspector, Hydro-Electric.
6. A. L. Long.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. A. W. P. Lowrie.....Toronto, Ont.
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- 3'. W. M. McAndrew.....Toronto, Ont.
Post-graduate Course in Engineering University of Toronto.
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Post-graduate Course in Engineering, University of Toronto.
2. J. T. MacBain.....15 Hill St., Buffalo, N.Y.
1. R. E. A. MacBeth.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. E. B. McColl.....Toronto, Ont.
Engineering Department, G.T.R.
1. F. M. Macdonald.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. W. S. MacKenzie.....Box 585, Woodstock, Ont.
With Canadian Linderman Co.
1. J. G. MacLaurin.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. J. B. McAndrew.....Toronto, Ont.
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3. J. A. McEachren.....Strathburn, Ont.
- 3'. R. W. McElroy.....Toronto, Ont.
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1. A. J. McFayden.....Toronto, Ont.
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3. W. G. McGhie.....Toronto, Ont.
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- 3'. D. A. McKenzie.....Toronto, Ont.
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- 3'. W. S. McKirdy.....Nepigon, Ont.
2. A. J. McLaren.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. A. G. McLeish.....Nairn Centre, Ont.
Mond Nickel Co.
1. R. A. McLellan.....Toronto, Ont.
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2. W. B. McPherson.....Toronto, Ont.
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- 3'. A. A. McQueen.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
4. H. H. Madill.....Toronto, Ont.
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- 3'. J. C. Martin.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. C. A. Meadows.....Box 467, Lachine P.Q.
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1. L. G. Mills.....Toronto, Ont.
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5. L. C. Mitchell.....Guantanamo, Cuba.
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- 3'. E. S. Noble.....Toronto, Ont.
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1. R. K. Northey.....Toronto, Ont.
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2. W. A. O'Flynn.....Toronto, Ont.
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1911—Continued

1. W. V. Oke.....Toronto, Ont.
Fellow in Drawing, University of Toronto.
2. J. A. Orr.....Toronto, Ont.
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- 3'. J. S. Parker.....Toronto, Ont.
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3. J. H. Parkin.....Toronto, Ont.
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1. J. M. Patton.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. R. A. Paul.....69 W. Washington St., Chicago, Ill.
3. C. L. Pearson.....Horseshoe Falls, Kananaskis, Alta.
Operator, Calgary Power Co.
3. W. J. Perrin.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. B. W. Pick.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. E. H. Porte.....329 Markham St., Toronto, Ont.
1. F. M. Pratt.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
4. H. Pullan.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. L. J. Quinlan.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. L. W. Railton.....4 West Park Road, New Port. Eng.
1. J. E. Ratz.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. F. N. Read.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
4. E. V. Reid.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. W. A. Richardson.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. W. E. Robinson.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. H. L. Roblin.....277 Piccadilly St., London, Ont.
3. L. W. Rothery.....E. Liverpool, Ohio.
Superintendent of Construction, Tri-States Railway & Electric Co.
4. T. L. F. Rowe.....11½ Melbourn Ave., Toronto.
- 3'. A. S. Runciman.....1151 Tenth St., Calgary, Alta.
- 3'. F. C. Rust.....29 Admiral Road, Toronto, Ont.

1911—Continued

3. F. G. Rutley.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. E. M. Salter.....Nepigon, Ont.
Division D., C.N.O. Railway.
1. F. R. Scandrett.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
5. J. W. Scott.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. N. D. Seaton.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. D. N. Sharpe.....407 Builders' Exchange Bldg.,
With Allan Findlay, D.L.S. Winnipeg, Man.
4. P. Sheard.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. W. A. Sibbett.....Bracebridge, Ont.
2. C. P. Sills.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto,
1. K. H. Smith.....Box 429, Kamloops, B.C.
Assistant Hydrographer, Departmt. of the Interior.
- 3'. M. L. Smith.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. R. G. Sneath.....Toronto, Ont.
Post-graduate Course in Enigneering, University of Toronto.
- 3'. L. V. Soules.....50 Tiverton Ave., Toronto.
- 3'. G. E. Squire.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. W. S. Steele.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
5. A. E. Stewart.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. R. O. Stewart.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. R. A. Story.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. C. F. Szammers.....1367 King St. W. Toronto, Ont.
3. R. Taylor.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. J. B. Temple.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. G. C. Thomas.....Barrie, Ont.
Assistant Manager, Simcoe Fruits, Limited.
1. R. D. Torrance.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.

1911—Continued

1. W. G. Tough.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. N. Vickers.....Renwick, Ont.
2. J. H. C. Waite.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. W. D. Walcott.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. G. L. Wallace.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. A. Wardell.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. F. E. Watson.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. P. G. Welford.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
2. A. G. Wheler.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. G. H. Wilkes.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
5. E. R. Williams.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. H. A. Wilson.....Glenora, Ont.
- 3'. C. S. Wood.....2066 3rd Ave. W., Vancouver. B.C.
With Electrical Construction Co.
1. W. G. Worden.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. W. J. T. Wright.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. F. H. Wrong.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
2. W. H. Wylie.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
- 3'. H. K. Wyman.....Essex, Ont.
- 3'. L. P. Yorke.....Thorold, Ont.
Electrician, Coniagas Reduction Co.
1. S. Young.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
3. A. Young.....Toronto, Ont.
Post-graduate Course in Engineering, University of Toronto.
1. W. E. Zinkan.....Southampton, Ont.

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